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PURPOSE: Determine the optimal provider staffing and process configuration for the Heidelberg Medical Department Activity Family Practice Clinic under 100% enrollment/empanelment of active duty military and family members in the local Heidelberg area.

METHODOLOGY: The project utilized empirical data collection of clinic processes, subject matter expert questionnaires, literature review, and automated simulation (animated). A status quo model was build, validated, and deemed credible by the clinic staff. From the status quo model, two alternative models were developed. One alternative model used an all physician provider mix whereas the other used a combination of physicians and physician extenders.

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U.S. ARMY-BAYLOR UNIVERSITY

MASTER'S of HEALTHCARE ADMINISTRATION PROGRAM

ANIMATED SIMULATION: OPTIMAL FAMILY PRACTICE CLINIC STAFFING AND PROCESS CONFIGURATION

A GRADUATE MANAGEMENT PROJECT SUBMITTED TO

THE FACULTY OF THE U.S. ARMY-BAYLOR MASTER'S of HEALTHCARE

ADMINISTRATION PROGRAM FOR SUCCESSFUL COMPLETION OF

REQUIREMENTS FOR THE DEGREE OF MASTER OF HEALTHCARE

ADMINISTRATION

CENTER FOR HEALTHCARE EDUCATION AND STUDIES

BY

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HEIDELBERG, GERMANY

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Executive Summary

Purpose of Project. Determine the optimal provider staffing and process configuration for the Heidelberg Medical Department Activity Family Practice Clinic (FPC) under the following conditions:

- 100% enrollment of military personnel and their family members in a primary care management program; each enrollee is assigned a primary care provider.
- the project is limited to the Heidelberg local area.

Background. Currently the FPC has six Family Practice Physicians. The FPC is scheduled to move into a larger newly renovated clinic. A primary care management program exists with a 4754 individual (voluntary) enrolled population consisting of 1406 families (family mean size of 3.44 persons). FY 1995 enrollee FPC utilization was 4.699 visits/enrollee per year. Mandatory military and military family member enrollment has been decreed by Department of Defense, Health Affairs. The non-enrolled population (military and their families) consists of 5540 beneficiaries.

Methodology & Discussion. The project utilized empirical data collected during FPC operation, HMEDDAC subject matter expert questionnaires, literature reviews, Department of the Army, and historical information as a basis to develop a concept and approach to satisfy the purpose of the project. Animated simulation (software by Promodel© called MedModel©) was used as an automated decision support system. A status quo model was developed and alternative models were derived from the status quo model. Both terminating and nonterminating simulation methodologies were designed and analyzed. Model process times were determined (n=101). An ANOVA, an omnibus test of means, was completed to detect model process differences and when significant differences were found, Pair-Wise t Tests of Means were completed. The status quo model was developed, validated, and deemed credible by the FPC staff. Alternative models, an all physician model (8 physicians) and a combination model (5 physicians and 4 physician extenders), were developed and compared to the status quo and each other. All models were significantly different. A comparison summary follows.

Comparison of Pivotal Issues of the Alternative Models

MODEL	Patient Total Time in FPC	Relevant Costs (provider & variable)	Issues Related to Decision
All Physician Model **8 physicians**	40.82 minutes (19.28 min wait time)	$777,688	Time to Implement Provider Availability Marketing Issues
Combination Model (mixed) **5 physicians and 4 physician extenders**	29.66 minutes (7.87-10 min wait time)	$778,381.65 (includes variable cost of 2661 more visits due to internal referrals)	Time to Implement Extender Availability Marketing Issues Privileging Issues

Recommendation. Resource/implement an **all physician (Physician Model)** in the FPC.

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LIST OF ABBREVIATIONS

ASIP	Army Stationing and Installation Plan
APN	Advanced Practice Nurse
AQCESS	Automated Quality of Care Support System
CHAMPUS	Civilian Health and Medical Program for the Uniformed Services
CHCS	Composite Health Care System
DAC	Department of the Army Civilian
DA	Department of the Army
DODDS	Department of Defense Dependent Schools
DOD	Department of Defense
FTE	Full Time Equivalent
FPC	Family Practice Clinic
HMEDDAC	Heidelberg Medical Department Activity
HMO	Health Maintenance Organization
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LANDCENT	Land Forces Central (NATO)
LAN	Local Area Network
MEPRS	Medical Expense Performance Reporting System
MHSS	Military Health Services System

NATO	North Atlantic Treaty Organization
NCOIC	Non-Commissioned Officer-in-Charge
NP	Nurse Practitioner
OTSG	Office of the Surgeon General (Army)
PA	Physician's Assistant
PCP	Primary Care Provider
USAREUR	U.S. Army Europe

INTRODUCTION

Conditions Which Prompted the Study

The evolution of managed care in the Military Health Services System (MHSS), specifically capitated budgeting, utilization management and primary care provider gatekeeping, encourages the use of creative approaches to effectively and efficiently manage healthcare operations. Process and staffing changes must consider cost, access, and quality and increase value to the health system for our beneficiaries. Balancing health promotion activities, cost avoidance initiatives, and beneficiary health improvement programs is a challenge inherent to the managed care system. During a TRICARE Conference held in Sonthofen, Germany, Dr. Edwin D. Martin, the Principal Deputy Assistant Secretary of Defense (Health Affairs), decreed that all European MTFs will enroll or empanel all military personnel and their family members within a Primary Care Provider (PCP) system to accomplish managed care objectives[1]. MTF Commanders were directed to actively manage care wherever it is delivered. One hundred percent enrollment of military personnel and their families is essential to managed care success in the European Theater. Total enrollment eliminates the need for redundant primary care avenues of access and enhances economies of scope and scale.

Heidelberg is located in southwest Germany in the state of Baden-Württemburg. The Heidelberg Medical Department Activity includes a sixty bed inpatient facility and nine outlying clinics drawing patients from an area over six thousand square miles. The

clinics stretch from Stuttgart to Butzbach, Germany. Appendix 1 page 6 includes a map of Germany and the communities within the Heidelberg Medical Department Activity Catchment Area.

The healthcare operation has characteristics of a fee-for-service system, an open health maintenance organization (HMO), and a closed panel HMO. In addition, emergency situations are covered by a point-of-service option of the system. The HMEDDAC mission statement is to "Provide quality health services and ensure medical readiness."[2] The Commander's vision statement for the organization is to become an "Accessible, patient-focused, customer-oriented, quality health care system"[3] which guides planning and future endeavors.

As the vision statement emphasizes, our customers are the focal point of system improvements. Customers are afforded beneficiary status based upon the employment status of a sponsor, such as a member of the military. Beneficiaries are assigned one of five categories: military personnel, military family members, NATO members, civilians and their family members (includes contract personnel), and retirees and their families.

Active duty (military personnel) beneficiaries must use military facilities as their initial point of care, similar to an HMO. Military personnel have the highest access priority within the MHSS. Supplemental care funds, that are used to pay for care provided by local civilian providers for active duty members, are preauthorized by the MHSS. Military employees and their families receive health insurance-like coverage and government provided health care as a benefit of service. Military family members are eligible to use the direct care health resources or local national CHAMPUS providers. The European CHAMPUS Project requires no copayment by the beneficiary.

DoD Dependent School System (DODDS) employees, contract personnel, and Department of the Army civilian (DAC) employees receive care on a fee-for-service basis. Payments for services are remitted either out-of-pocket from the beneficiary, or are paid by private insurance, or a combination of both. Eligible civilian beneficiaries are grouped under the DAC status.

Unique to the MHSS, North Atlantic Treaty Organization (NATO) employees, military and civilian, receive care on a fee-for-service basis that is paid for by the individual's country. The NATO employees are assigned to LANDCENT in the Heidelberg area. NATO LANDCENT personnel were granted beneficiary status by formal memorandum of agreement between the U.S. and NATO.

U.S. military retirees and their families represent the fifth beneficiary category. Retirees, up to age 64 and their family members, use the MHSS or CHAMPUS. If age 65 or older, the member can only use the MHSS without incurring significant out-of-pocket costs. Medicare does not pay for care outside the United States and thus these beneficiaries are not covered under the Medicare umbrella. Also, by law CHAMPUS cannot cover retirees or their family members once the individual beneficiary obtains Medicare eligibility. This is a serious dilemma for this segment of the population.

Based upon these five distinct beneficiary categories, the HMEDDAC system must be flexible to cater to everyone's needs. There are 75,317 total beneficiaries in the HMEDDAC area of responsibility including 538 NATO members and their families.

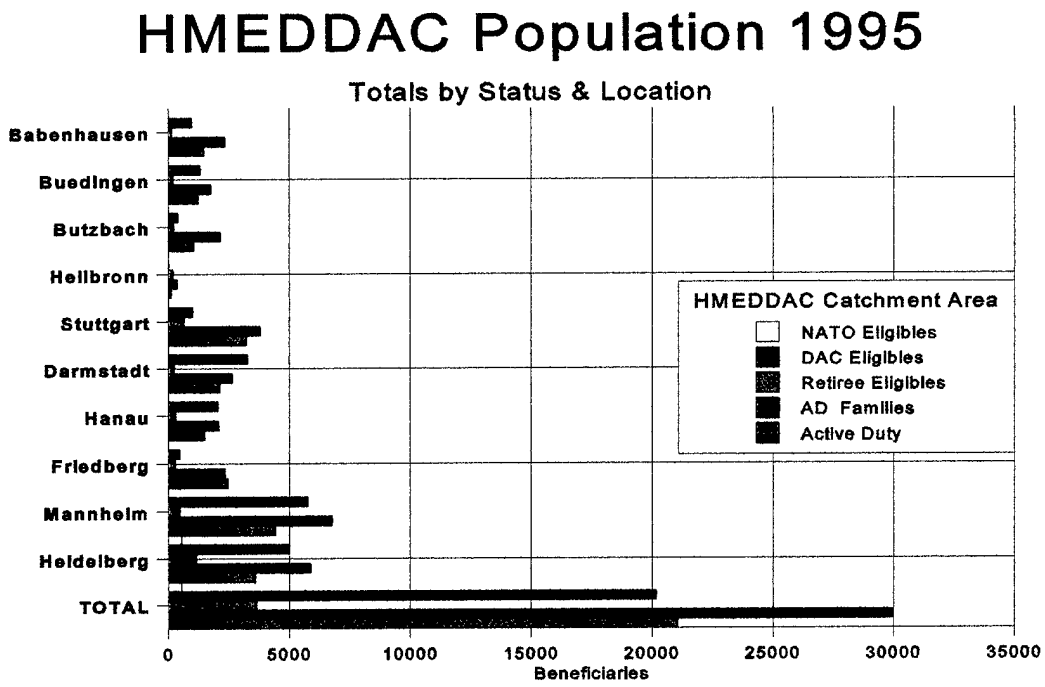


Figure 1. HMEDDAC Catchment Area Beneficiary Population by Status & Location.
Source: HMEDDAC Resource Management Analyst, Mr. Keith Deardon, ASIP Data, 11 September 1995.
Note: Heilbronn Beneficiaries Access Care in Heidelberg, Germany.

Within the Heidelberg local area, representing 21.5% of total catchment beneficiary population, there are 16,140 total beneficiaries including 538 NATO members and their families. Almost 60% of the local Heidelberg area beneficiaries are active duty or active duty family members. Beneficiary population data is derived from the Army Stationing and Installation Plan (ASIP) which is the basis for capitated budgeting; NATO beneficiary numbers are provided by LANDCENT. The specific beneficiary status and representation within the Heidelberg local area is illustrated in the following graphic.

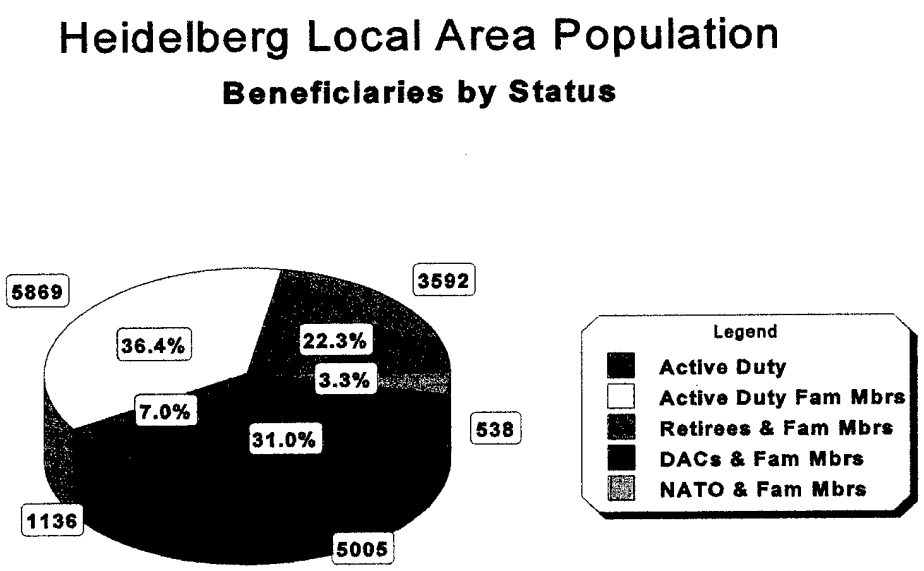


Figure 2. HMEDDAC Catchment Area: Heidelberg Local Area Beneficiaries by Status.
Source: HMEDDAC Resource Management Analyst, Mr. Keith Deardon, ASIP Data, 11 September 1995.

The typical annual workload shows that the HMEDDAC catchment area resembles a rural community health system although located in a highly populated German region. Fiscal Year (FY)1995 workload figures are:

- 38 admissions/day (average).
- 532,000 outpatient visits (total catchment area).
- 2,130 surgeries performed.
- 770 deliveries.
- 523,000 prescriptions filled.
- Per Capita Patient Cost = $1,194.07 (MEPRS data, 11 September 1995; see notes on page 96).

Since HMEDDAC resembles a rural community hospital, the command relies heavily on CHAMPUS and local national health care providers. The HMEDDAC Executive Committee believes the quality of German health care is comparable to American standards. This claim is supported by comparing United States disease and trauma mortality rates and life expectancy rates to German rates.[4] In FY 95 there were 2,579 inpatient admissions and 37,878 outpatient visits throughout the HMEDDAC area where care was provided by local national CHAMPUS providers.

Significant changes and challenges are in HMEDDAC's future. Not only is the organization preparing for a JCAHO Survey in the Spring of 1996, but also will embark on a phased reengineering of healthcare operations. Current projects include the following:

- Research, organize and develop a Managed Care Branch under the supervisory control of the Clinical Support Division.
- Install the Composite Health Care System (CHCS) and a local area network (LAN) throughout the catchment area.
- Continue to develop and refine the Utilization Management function.
- Renovate the Family Practice Clinic (Construction Project).
- Initiate a continuous Health Promotions Program.
- Integrate Medical and Dental Health Services Promotion and Screening.
- Adjust from an Incremental Budget to a Capitated Budget.

The Managed Care Branch and the managed care initiative depends on active primary care management. Managed care projects and processes will emphasize the Family Practice Clinic (FPC) as the system gatekeeper, and total beneficiary enrollment in a primary care management program. The FPC will be the target for marketing, health

promotion, case management, and cost avoidance initiatives[5]. Case management will focus on outpatient as well as inpatient services due to the large number of ambulatory encounters historically observed at HMEDDAC. Primary care providers (PCP)s will benefit from the research efforts and be highly involved in a team approach to managed care. This program has evolved by informing the FPC providers of local national CHAMPUS and Preferred Provider Network services within the local economy.

In 1993 through 1994 MAJ John P. Cook completed a Davies & Ware Patient Satisfaction research project that began an effort toward voluntarily enrolling beneficiaries into the Family Practice Program (primary care management program) and renovating the Family Practice and Outpatient Clinics. This endeavor was a patient-focused/customer-centered improvement to the hospital. The newly renovated Family Practice and Outpatient Clinics are scheduled to open in the Spring of 1996. Under a capitated budget, this project and the new requirement to enroll all active duty beneficiaries and their family members demand a cost effective managed care approach to staff the FPC.

The HMEDDAC FPC seeks to enroll all eligible active duty sponsored beneficiaries to include single soldiers. The intention of the enrollment program is to increase the level of patient satisfaction with the MHSS by improving continuity of care, establishing a "family doctor" relationship and improving access to the healthcare system. The HMEDDAC Executive Committee intends to utilize the FPC as the gatekeeper within its managed care system.

The HMEDDAC Primary Care Department includes six sections: 1) FPC, 2) Internal Medicine Clinic, 3) Pediatrics Clinic, 4) Ob/Gyn Clinic, 5) Outpatient Clinic,

and the 6) Emergency Room. Currently, only the FPC, Outpatient Clinic, and Emergency Room function as pure primary care clinics. The Pediatrics and Ob/Gyn Clinics function as primary care clinics in predetermined capacities such as the well baby and healthy woman program of services. The Internal Medicine Clinic, as well as most Pediatric and Ob/Gyn services, requires a referral from the pure primary care sections. The configuration is necessary due to the referral demands of internal and outlying clinics as well as resource constraints.[6] Patient initial entry into the system is through pure Primary Care Clinics: the FPC, Outpatient Clinic, and the Emergency Room. Current Primary Care Department physician staffing, by specialty, is: six family practitioners, two general medical officers, five pediatricians (one is an adolescent care specialist), and five internists.[7]

The HMEDDAC FPC must expand to meet the beneficiary enrollment goal. FY95 HMEDDAC FPC patient visits totaled 22,339 (including telephone consultations) with a voluntary enrolled population of 4,754 individuals. A detailed enrollee population breakdown is enclosed as part of Appendix 1. This constitutes an average enrollee FPC use of 4.699 visits per year. All non-enrolled beneficiaries utilize the HMEDDAC Outpatient Clinic for primary care needs. The current FPC provider staffing stands at five military physicians, one civilian (GS) physician, six medical support staff and three administrative support staff. Physician extenders are not utilized.

The FPC staff ackowledges that they must be the centerpiece of managed care operations. In a 26 September 1995 memorandum, Maj Beverly I. Maliner, Chief of Family Practice, expressed her vision to expand the clinic's role "as the primary source of ongoing health care for military families from the Heidelberg community[8]." This

aspiration directly corresponds with DoD, DA and HMEDDAC directives.

The FPC must be able to provide primary healthcare and gatekeeping to military personnel and their family members, NATO sponsored beneficiaries and have the flexibility to retain current retired and DAC beneficiaries (and their family members) who are enrolled. Both nonenrolled retiree and DAC beneficiaries will be enrolled on a case by case voluntary basis as resources permit. Table 1 portrays the current situation with regard to enrollment in the local Heidelberg area.

Table 1. Heidelberg Local Area Enrolled versus Nonenrolled Population.

Beneficiary Status	Total Enrolled	Total Not Enrolled	Enrollment Goal
Active Duty Military	1431	2346	3592
Active Duty Family Members	3028	3194	5869
NATO Eligible Members	0	538	538
Retirees and Family Members	293	843	293
DAC and Family Members	2	5003	2
TOTALs	**4,754**	**11386**	**10,294**

XXXX = Enrollment Required; Segment of Beneficiary Population Targeted: Priority 1.
XXXX = Enrollment Determined by Excess Capacity: Priority 2.

For managed care to be successful, the FPC must be staffed to provide adequate support to all military personnel and their families before enrollment into the Family Practice Program begins. The staffing configuration must foster a patient- focused system that ensures access, continuity of care, and patient satisfaction. Enrolling all

military personnel and their family members is the FPC's first priority followed by retired beneficiaries and their families and then DAC eligible beneficiaries.

STATEMENT OF THE PROBLEM

The terminal objective of the research effort is to determine the optimal provider staffing and process configuration for the Heidelberg Family Practice Clinic. The staffing and process configuration must service the needs of Heidelberg's Primary Care Management Program and its enrolled beneficiaries. The enabling objectives supporting the terminal objective follow.

- *Performance Analysis:* How does the FPC system perform in the current configuration?
- *Capacity Analysis:* What is the maximum capacity of the currently configured FPC?
- *Capability Analysis:* Is the FPC capable of servicing a total enrollment of military personnel and their family members in Heidelberg (48,372 visits/year; this figure is derived by multiplying the target goal of 10294 beneficiaries by the FY95 mean annual visit/enrollee rate of 4.699)? If not, what additions and/or changes to the FPC system are necessary?
- *Comparison Analysis:* How does each FPC configuration compare to other alternatives? What is the most feasible alternative?

LITERATURE REVIEW

Family practice is a prominent focal point of primary care activities. Primary care focuses on early detection and routine care[9] and is the first level of care directly accessed by the patient. For many managed care organizations, such as health

maintenance organizations (HMO), the family practice provider is the patient care manager. The systematic patient management function at the primary care level is termed gatekeeping.

The first patient entry point into the health care system is generally at the primary care level. According to Peter R. Kongstvedt, primary care providers manage patients (gatekeeping) within the health care system. The need to educate and focus information to the PCP is essential to realize efficiencies within the existing care system.

Several provider categories are considered primary care. Within the physician realm, general practitioners, family practice, internal medicine, pediatrics and, in some sources, obstetrical/gynecological physicians provide primary care services within the health systems. Physician extenders in primary care include nurse practitioners, physician assistants and nursing clinical specialists.

Primary care patient management by providers can realize cost avoidance and improve health encounter scheduling. A study that investigated the adult utilization levels before and after initiating a gatekeeping system found that significant decreases were achieved in emergency room and specialty services use. Emergency room visits and specialty visits without primary care physician participation dropped 46% ($p = .01$) and 34% ($p = .01$) respectively.[10]

Patient Focused Primary Care

The HMEDDAC Commander's vision statement begins with the word accessible. "Access to care includes being able to make an appointment to see one's physician in a timely fashion, not having to wait a long time in the physician's office, and being able to

speak to one's physician on the telephone. "In two studies, each involving more than 1200 patients, access to care and provider continuity were most closely associated with patient satisfaction."[11] The essential system characteristic of patient-focused and customer-oriented care is a patient's access to timely primary care with a provider that the family/soldier has developed an ongoing professional relationship. As patient autonomy and organizational concerns about patient satisfaction grow, a primary care management system within a managed care environment can both improve customer oriented care and provide the efficiencies of a gatekeeper system..

A high level of patient satisfaction should be the goal of all health care organizations. "Donabedian identifies two principal components as composing the quality of medical care: technical aspects of care and the interpersonal relationship between the provider and the patient. Technical quality is primarily reflected in clinical outcomes. Interpersonal processes of care, such as accessibility, continuity, and personal accountability, affect patient satisfaction with care."[12] An enrolled population, if afforded a reasonable beneficiary to provider ratio, should have timely accessibility, continuity of a provider/patient relationship, and the satisfaction that their provider is accountable for their care.

The managed care philosophy has grown in acceptance and implementation. This trend continues as the United States wrestles with an increasing proportion of Gross Domestic Product (GDP) going toward health care. "Over the past decade, enrollment in HMOs has tripled, and continued growth is anticipated."[13] The basic characteristics of primary care management, intent on creating efficiencies that lead to health care cost

reduction, are diffusing throughout the health care industry. The MHSS has embraced this philosophy to realize similar system efficiencies.

Alternative Primary Care Staffing

The role of physician extenders in health care has increased due to managed care initiatives. The basic intent of extenders is at the heart of managed care: cost effective primary care services, patient management, and health promotion. "The introduction of nurse practitioners and physician assistants in the late 1960s and 1970s was intended to increase the availability of primary care services, improve primary care through better patient education and counseling, and reduce costs."[14] There are many primary care configurations that include physician extenders due to their cost effectiveness. "The variety of staffing patterns found among HMOs operating in highly competitive markets suggests the importance of considering alternative configurations for meeting national requirements for primary care."[15] Well-established managed care organizations have employed extenders for years. "Kaiser Permanente has used nurse practitioners and physician assistants for 30 years with varying degrees of success. In most of our regions, they serve as the primary care provider for patients with a predetermined range of signs and symptoms. Generally, though, where they have been used, nurse practitioners have demonstrated cost savings, patient satisfaction with the quality of care they give, and a high level of personal satisfaction with their work"[16]

Physician extenders provide routine care services, allowing physicians to concentrate on more difficult cases. "In group practices, the use of nurse practitioners and physician assistants has allowed primary care physicians to avoid routine care of well

patients, and some routine care of patients with acute and chronic conditions."[17] "Fully 86% of closed panel plans reported using nonphysician providers (compared with 48% of open panel plans), 52% of plans used physician assistants, 52% of plans used nurse practitioners, and 28% of plans used nurse-midwives"[18] according to a 1995 publication. According to twenty-one executives from managed care organizations across the United States, including Kaiser Permanente, Humana, the Harvard Health Plan, and Group Health of Puget Sound, the use of physician extenders in health care (especially primary care) is an alternative staffing method that is cost effective and ensures quality care.[19] Also throughout the literature, patient satisfaction with extender provided care is high.

Physician Extender Supervision

Since physician extenders have entered the health care system, a struggle between physicians and extenders has been present. The level of physician supervision of extenders versus extender clinical autonomy is the topic of heated discussion. As physician extenders become more prevalent in clinical practice, each organization will have to compromise to create an environment focused on quality patient care.

Some situations, such as rural health care, have dictated that extenders practice independently. "NPs and PAs have provided essential care for years, often in places too poor or sparsely populated to attract many physicians."[20] Rural autonomous practice opportunities have shown that NPs and PAs are competent members of the health care team.

Physician supervision of extenders is a crucial issue that impacts institutional clinical protocols, privileging, and productivity. Organizations that intend to utilize

extenders must consider the positive and negative impacts upon the health care system before including extenders in the provider pool. "Organized nursing has long advocated allowing nurses to practice more independently, while organized medicine has been equally vocal in insisting that extenders need direct supervision by physicians."[21] "In recent years, many states have granted nurse practitioners greater independence and some prescriptive authority, but experts say that both sides need to cooperate to provide needed primary care with the most efficiency and least turmoil[22]." As in the Humana Group Health Plan, Incorporated, "the amount of supervision varies depending upon the experience of the associate practitioner (physician extender) and the preferences of the supervising physician. Most function relatively independently of the supervising physicians, discussing problem cases with the physician on an "as needed" basis."[23] As the need for cost effective primary care increases, and the professional relationship develops between the clinical staff, the physician supervision of the extender will generally drop. Florida Public Law (21M-17.001) mandates the use of an eight component test for physician supervision of extenders: 1) Complexity of the task, 2) Risk to the patient, 3) Background, training and skill of the extender, 4) Adequacy of the direction in terms of its form, 5) Setting in which tests are performed, 6) Availability of the supervising physician, 7) Necessity for immediate attention, and 8) Number of other persons whom the supervising physician must supervise.[24] The key is to have a reliable and valid extender evaluation and audit system within the personnel and quality improvement/assurance functions. "Health care organizations and systems are recognizing that they're going to need a lot more NPs and PAs to work with doctors on

their health care teams."[25] Utilizing physician extenders is a reality of medical practice in an environment of decreasing resources and increasing budgetary constraints.

Managed care organizations develop the physician extender clinical privileges that fit the needs of the organization. In a broad research effort of McKinney Act Clinics, one study found that "about 40% of clinics reported using nurse practitioners as independent providers of health services. In these clinics, less than one half of the patients first seen by a nurse practitioner were referred to a physician."[26]

Once beneficiary epidemiology patterns are established and clinical screens and protocols are developed by the organization, physician extenders, to include other nursing specialties can perform primary care duties to service the beneficiary population at reduced cost. "The reason APNs (Advanced Practice Nurses) are so valued is that they can perform 60 to 80 percent of primary and preventive care traditionally performed by physicians - at a far lesser [lower] cost."[27] The literature emphasizes, "Leaving the uncomplicated, repetitive primary care tasks to extenders leaves physicians free to treat and spend more time with more seriously ill patients."[28] The use of alternative provider staffing configurations in primary care is a proven method of quality care in managed care arrangements. The PCP managers, the gatekeepers, if willing to utilize extenders, can increase the number of enrolled beneficiaries with the potential of decreased per capita cost. "All of this isn't a matter of working physicians out of a job; it is a matter of making them more efficient and effective within the emerging health care system.."[29] "Increasingly, physicians with organizational skills are being recruited to assume responsibility for top level managerial positions, for motivating others, for assessing

performance, and for developing good working relationships with other health professionals, non-professional employees, and subscribers and patients alike."[30]

Primary Care Staffing

Staffing of PCPs varies depending on the maturity of the managed care system and missions that the providers must perform. The Office of the Surgeon General of the Army (OTSG) staffing ratio considers provider non-patient time. The OTSG staffing ratio range is within parameters of civilian managed care systems as provided in the literature. OTSG utilizes a 1 PCP to 1000 - 1250 beneficiaries ratio range and a enrollee utilization rate range of 4-5 visits per enrollee per year.[31] "Large, mature closed panel plans that serve a primarily commercial population have an average PCP staffing ratio of 0.8:1,000 (1 PCP to 1250 beneficiaries)."[32] The literature shows, PCP to beneficiary ratios ranged from 1:1000 to 1:5000. The majority of the literature shows rates of 1:1250 to 1:2500 PCP to beneficiary range. Although the OTSG uses the lower ratio, the Army PCP contends with readiness duties that may not be present in the civilian sector. MHSS beneficiaries incur no out-of-pocket cost to use the system. This fact increases the moral hazard potential that ultimately cummulates in higher utilization patterns for health care services.

Physician supervision and scope of practice impact physician extender staffing ratios. "A nonphysician provider may be considered 0.8 of an FTE (full time equivalent) for PCP staffing purposes."[33] This ratio is consistent with extenders who practice with limited supervision. As physician supervision increases, the ratio decreases. A Harvard Community Health Plan analysis suggests that 28% of patient encounters required a

physician but physicians actually provided 66% of patient visits.[34] This study suggests that organizations with physician extenders adopt a thorough patient records screening procedure to maximize extender utilization.

Staffing Models and Costs

Many staffing models exist throughout the health care system. The spectrum spans pure physician to pure nurse practitioner/physician assistant models. As long as quality is ensured, the staff configuration must change to meet organizational, clinical, managerial, and financial needs. Staff size is a consideration with regard to efficiency and effectiveness. In reference to staff or clinic size, each organization must understand where economies of scope and scale are maximized and where diminishing marginal returns begin.[35]

Utilizing physician extenders is a cost effective method for delivering primary care but only if the extender can increase the team empanelment to a certain level. Beneficiary empanelment increases of 650 or more are needed for each additional extender to realize cost savings. "By expanding the panel size for an MD/NPP (non-physician provider) team by more than 650 patients we were able to predict a linear increase in savings."[36]

Clinic processes and activities impact all phases of clinic operations. Moving patients effectively through the clinic system increases the potential of available patient visits and decreases patient waiting times. A study of waiting lists revealed that implementing, where possible, quasi-parallel processes would decrease waiting times significantly."[37]

Tying staff models and organizational realities together is difficult as managers contend with restrictive budgets and little time. A method new to health care, computer simulation, allows the manager to make more informed decisions without committing significant resources. Simulation is a cost-effective method to compare staffing and process alternatives.

Simulation: A Decision Support Tool

Simulation, especially animated versions, is a decision support system that allows leaders and managers to make departmental and operational determinations without significant commitment of scarce resources. There are, however, crucial steps in simulation modeling. "The most important ingredients for a successful simulation project include: having a well defined set of objectives, using a team approach to the project, following good simulation methodology and obtaining accurate input data."[38] Literature about health care simulation is not prolific in common research sources. Simulation is relatively new to health care. Edwards, et al. describes an outpatient primary care clinic and how "observations of clinic management structures, patient flows and times measured were used in the construction of a computer model of our outpatient clinics."[39] The need to test alternatives in a resource constrained environment has facilitated the use of simulation in health care as a decision support tool. "Queuing theory, the analysis of waiting lines, critical path analysis, the scheduling of subtasks in order to complete a larger task, and network flow modeling which identifies bottlenecks in network systems are just some of the techniques which have direct applications to medical outpatient clinics."[40] Input variables of the modeled environment must be

carefully selected to ensure that the simulation supports the decisions to be made. "Good sources of system data include the following::

- Care Plans
- Time Studies
- Predetermined Time Standards
- Flow Charts
- Facility Layouts
- Market Forecasts
- Care Providers
- Equipment Manufacturers
- Managers
- Management Engineers
- Management Personnel
- Facility Walk-Throughs
- Comparisons with Similar Operations
- Maintenance Reports."[41]

Several simulation researchers followed similar methodologies. Lowery's methodology grouped data into distributions, computer software tested empirical against theoretical distributions, and the most representative distributions, where no significant difference was found, were used in the simulation model.[42] Comparing simulation mean times with empirical mean times, the model was considered valid when no significant difference was present.[43] This method of mean testing is used primarily for non-terminating simulations. Terminating simulations utilize the same methodology but means are not as meaningful as utilization rates.

Reliability and Validity in Simulation

Modeling an environment completely is a difficult if not impossible task. The level of model detail greatly impacts reliability and validity. "The level of model detail within a simulation is determined by four key factors: the time requirements, the

availability of data, the modeler's past experience with similar projects, and a knowledge of the system."[44] The literature converges at a basic single point: obtaining face validity. Face validity means that by examination, the model resembles what was intended. According to a 1979 publication by Schlesinger, "From this standpoint, validating a model is the process of substantiating that the model, within its domain of applicability, is sufficiently accurate for the intended application."[45]

As subject matter experts of the modeled environment, clients can propel the simulation model past the point of "face validity." A model must be accepted as a credible model by the clients.[46] Law and Kelton illustrate the process in the following graphic.

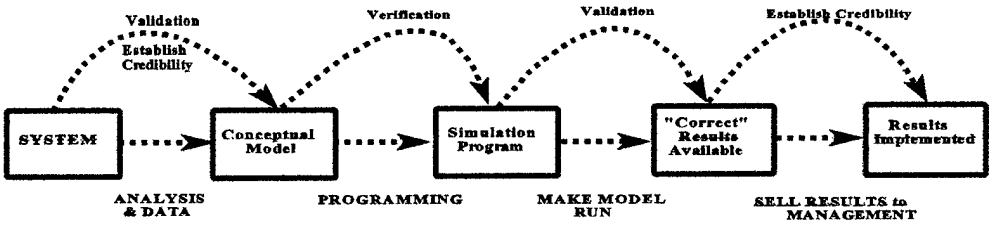


Figure 3. Timing and Relationships of Validation, Verification, and Establishing Credibility.
Source: Law, Averill M.and Kelton,W. David. Simulation Modeling and Analysis, 2d Edition. New York: McGraw-Hill, Inc., 1991. pg 299.

Summary

Balancing managed care implementation and improving patient satisfaction with the MHSS are challenging tasks. Employing a more team-oriented approach to primary care by including physician extenders may allow successful completion of both missions,[47] but will require a shift in organizational values. Simulation, as a decision support system, is a viable tool for gaining knowledge about alternative staffing and processing models. Combining simulation analysis with cost-effective methods to provide patient care maximizes an organization's ability to improve the health status of beneficiaries.

PURPOSE

The purpose of the research effort is to determine the optimal provider staffing and process configuration for the Heidelberg Medical Department Activity Family Practice Clinic under the following conditions:

- 100% enrollment of military personnel and their family members in a primary care management program; each enrollee assigned to a primary care manager.
- The project will be limited to beneficiaries living in the Heidelberg local area.

Animated simulation will support the effort. Enabling objectives include:

- Determine current FPC provider staffing and provider service rates.
- Determine FPC patient flow patterns and time dependent and condition dependent input variables.
- Determine the number of FPC providers required to meet the enrollment goal utilizing the 1 provider to 1300 beneficiary ratio expressed in annual enrollee FPC visits, at 4.699 visits/enrollee per year. Note: the 1:1300 ratio is derived from the HMEDDAC informal Subject Matter Expert Questionnaire (Appendix

4-5) and is within the OTSG and literature staffing parameters.

- Determine the current Family Practice Program enrollment and non-enrolled eligible beneficiaries to determine the effort required for total enrollment.
- Determine processes that maximize utilization of resources in the newly renovated FPC area.
- Determine the HMEDDAC leadership's range of acceptable FPC staffing alternatives (includes mission needs, care quality, and cost effectiveness).

A follow on purpose of simulation is to provide the FPC capability to explore future improvement alternatives. The following table lists major supporting project objectives.

Table 2. Subordinate Project Objectives.

Subordinate Objective	Simulation	Background Information
Determine Patient Flow/Process	-Interarrival Times - Waiting Times - Screening Times - Provider Service - Ancillary Use	- FPC Procedures - Historical Ancillary Use
Determine Current FPC Beneficiary Enrollment		- Status Quo - Enrollment Delta
Determine Current Eligible Beneficiary Population	- Capability Analysis	- Enrollment Delta
Determine current FPC Provider Staffing and Clinic Time Utilization	- Status Quo Model	- Current Staffing - Provider Clinic Time Utilization Rates
Determine Primary Care Provider:Enrollee Ratio	- Number of Providers Needed and/or Mix	- FPC Provider to Enrollee Ratio
Determine Physician Extender Productivity	- FTE of NPs & PAs in Alternative Models	
Determine Physician Supervision of Physician Extenders	- Impact on Physician FTEs in Alternative Models	
HMEDDAC Acceptable Solutions (Alternatives)	- Alternative 1 - Alternative 2	Modeled in the Newly Renovated FPC Area

Items under study include specific variables pertaining to the supporting objectives. Variables under study include:

- Total FPC capacity (enrolled population) represented by visits per year.
- Number of FPC providers required to serve the enrollment goal.
- Patient interarrival time.
- Patient Screening service time.
- Patient waiting times.
- Patient service time by the FPC provider.
- Model alternatives (configurations) that provide response (simulation generated) variables specific to FPC provider staffing.
  - Provider Utilization Rates
  - Locations (Reception Area, Waiting Rooms, Screening Rooms, and Exam Rooms) Utilization Rates

Models Simulated

Three models will be simulated. The initial model will represent the status quo of the FPC and will be named the Status Quo MedModel©. Alternative models will be based on the status quo model with specific changes to support enabling objectives and the terminal objective. The two alternative models will represent an all physician model, called the Physician MedModel© and a combination (a physician and physician extender mix) model called the Combination MedModel©. The alternative models will be derived by using the QuatroPro© spreadsheet functions with regard to certain constraints (such as 1 physician must be on the FPC staff for each physician extender based upon HMEDDAC Leadership guidance) and based on minimum annual provider cost (MEPRS

replacement cost). Both alternatives will be modeled in the newly renovated FPC area.

The following hypotheses will be tested within the simulation models; and all supporting subordinate hypotheses are provided in Appendix 2:

Model Verification and Performance

Model verification ensures that the animated computer simulation model represents the modeled environment. The inferential statistical test must reveal no significant difference between the empirical data and the Status Quo MedModel©.

Ho: There is no significant difference between the FPC Status Quo MedModel© and the empirical data.

Ha: There is a significant difference between the FPC Status Quo MedModel© and the empirical data.

Model Capacity and Performance

Once the Status Quo MedModel© is verified, validated, and credible, model capacity and performance hypotheses are tested. The capacity of the models (patient visits per year) and provider utilization rates are compared to reveal differences.

Ho A: There is not a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ha A: There is a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho B: There is no significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ha B: There is a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Model Comparison

After demonstrating that the two alternative models can service total enrollment goal needs, the models are compared to each other. Significant differences between models are revealed with regard to time and condition dependent activity means, provider utilization rates, and capacity (expressed as patient visits).

Ho C: There is no significant difference (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ha C: There is a significant difference (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

METHODS & PROCEDURES

The project focuses on animated simulation, a decision support system, to assist in determining the FPC provider staffing and process configuration that will support total primary care program enrollment within the local Heidelberg area. The FPC was studied to gain knowledge of the environment being modeled. A synopsis of the project time line and data collection is enclosed as Appendix 3. The project conceptual model is presented in Figure 4 on the next page.

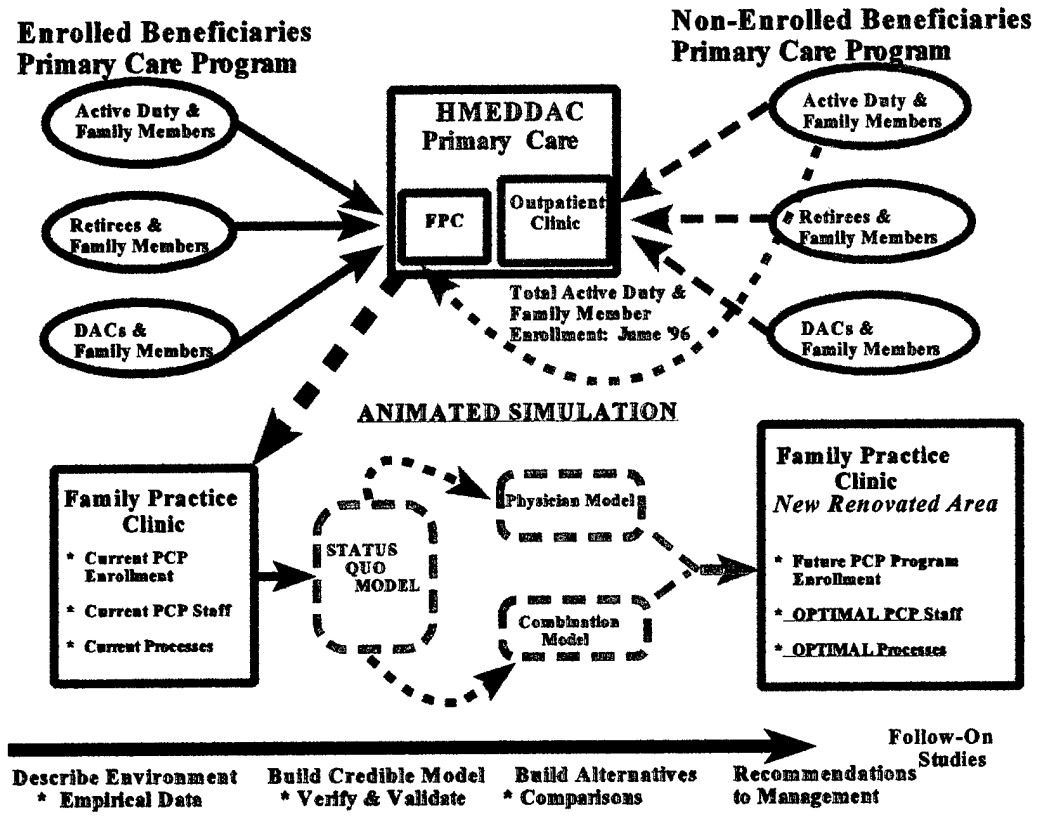


Figure 4. Animated Simulation: FPC Conceptual Model.

Description of the Modeled Environment

The FPC provider staff includes six providers with an average patient care availability rate of seventy percent. FPC provider clinic time is summarized as part of Appendix 1. The providers are all family practice physicians staffed with five military and one civilian. Each provider has a portion of the enrolled population in their panel under the primary care managment program. Each provider utilizes one examination room. The providers assist each other to cover for times of training, leave, or deployments. The physicians also assist operationally, when other FPC providers are

overwhelmed, by seeing patients outside their panels. The providers have a differing range of actual independent clinical experience ranging from recent residency graduates to several years of clinical experience.

The current enrolled beneficiary population is 4,754 individuals with a high proportion of military personnel and their family members. Enrolled individuals can schedule appointments through central appointments, present as a walk in patient, or if active duty military, can present without an appointment before normal clinic hours during "sickcall." Walk in patients are placed in a lower priority than scheduled patients but are placed in either unbooked or no show appointment slots or are worked into the schedule. Beneficiaries not enrolled in the Family Practice Program access care at the Outpatient Clinic; the FPC is not available for their primary care. The FPC is open Monday through Friday but only half a day on Thursday. Saturday and Sunday the clinic is closed. Weekend patient healthcare needs are met by an acute minor illness clinic superimposed onto the emergency room function. The mean enrolled beneficiary family practice clinic use rate is 4.699 visits per enrollee per year. Enrollment data, enrollee FPC yearly use rates, and appointment utilization are detailed as part of Appendix 1. According to AQCESS data, FPC providers see 23 - 25 patients a day. Patients, once enrolled in the program are assigned to one of the six FPC providers. The provider is responsible for patient management and is accountable to the patient. The clinic daily schedule is found in Table 3.

Table 3. HMEDDAC Family Practice Clinic Hours of Operation: Monday - Friday, Closed Thursday Morning.

0715 hr	**0845 hr**	**0900 hr**	**0920 hr**	**0940 hr**	**1000 hr**	**1020 hr**	**1040 hr**
Sickcall Begins for Active Duty	Clinic Opens	1st Scheduled Appt	2d Scheduled Appt	3d Scheduled Appt	4th Scheduled Appt	5th Scheduled Appt	6th Scheduled Appt
1100 hr	**1120 hr**	**1145 hr**	**1245 hr**	**1300 hr**	**1320 hr**	**1340 hr**	**1400 hr**
7th Scheduled Appt	8th Scheduled Appt	Clinic Closed for Lunch	Clinic Open for Afternoon Appts	9th Scheduled Appt	10th Scheduled Appt	11th Scheduled Appt	12th Scheduled Appt
1420 hr	**1440 hr**	**1500 hr**	**1520 hr**	**1540 hr**	**1600 hr**	**1700 hr**	**1800 hr**
13th Scheduled Appt	14th Scheduled Appt	15th Scheduled Appt	16th Scheduled Appt	17th Scheduled Appt	18th Scheduled Appt	Complete Appts and Close	Clinic Closed

Patient flow in the FPC is a combination of serial and parallel activities. The patient presents to the clinic prior to the scheduled appointment time to sign into the reception area. From reception, the patient is screened and sent to the waiting area. When the provider is available, the patient is seen and either released from the system or sent to the laboratory, radiology, respiratory therapy, or the pharmacy. If required, the patient returns from the ancillary service(s) to the same provider. Table 4 illustrates the time and condition dependent activities and input variables obtained from observations.

Table 4. Family Practice Clinic Patient Flow : Time & Condition Dependent Activities, Input Variables, and Response Variables.

Activity in FPC Patient Flow	**Time Dependent Activity**	**Condition Dependent Activity**	**Obtained Input Variables**	**Corresponding Response Variables (Simulation)**
Patient Arrival	X		Interarrival Rate	Total Entries
Patient 1st Wait		X	1st Patient Wait Time	Average Wait Minutes
Patient Screening	X		Screening Service Time	Average Minute/Entry
Patient 2d Wait		X	2d Patient Wait Time	Average Wait Minutes
Patient Seen by Provider	X		Provider Service Time	-Average Minute/Entry -% Provider Utilization
Patient Sent to Ancillary Service		X	% of Patients Sent: - Laboratory - Radiology - Pharmacy	Total Entries - Laboratory - Radiology - Pharmacy
Patient Returns to FPC Provider (same provider)		X	% Patients Returning to FPC Provider	Constant
Returned Patient Seen by Provider	X		2d Provider Service Time	Constant
Patient Exits FPC		X	No. of Observations Total Time in FPC	-Total Exits -Average Process Min

The Chief and the Non-Commissioned Officer In-Charge (NCOIC) of the FPC validated the description and FPC patient flow depiction that follows in Figure 5.

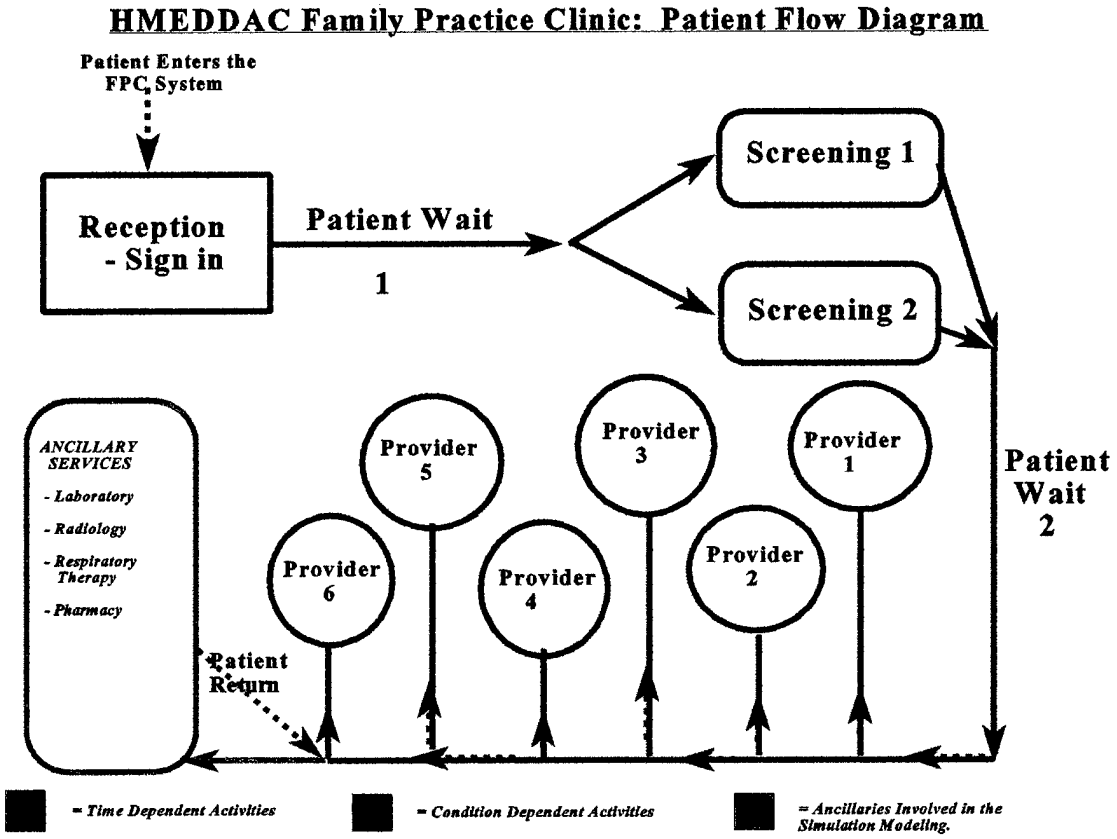


Figure 5. Family Practice Clinic Patient Flow Diagram.
Source: Author Observations, September 1995 - October 1995.

The two waiting areas in the FPC are group areas. Patient screening and the patient visit with the provider are quasi-serial activities. Quasi-serial events are activities that must be completed before the next event can begin. The activities are not combined in one area. Quasi-parallel activites, for FPC purposes, could occur if the screening process was combined with the exam process. Contrasting the two methods, quasi-serial and quasi-parallel, serial activities are more linear in nature and parallel activites expand the possibility of the number of stations for an activity or event. The parallel method

increases patient throughput. In the case of the FPC, the screening activity has two stations. These activities allow more than one patient to be serviced at a time with different staff members. Group areas consist of areas where two or more patients can be located simultaneously. Group areas include the first waiting area, screening area, and the second waiting area. Activities are not combined in one area. As an example, screening occurs in a separate area than the area where the patient visit with the provider occurs.

Patients are treated as walk-ins if they are required to return to the FPC after visiting the ancillary service(s). These patients are "fit" into the schedule and return to the same provider that sent them to the ancillary service(s). Few patients (4.95%) are required to return to the FPC after the ancillary service(s).

Scope

The scope of the project is limited to the HMEDDAC Family Practice Clinic. A comparison between the current provider staffing configuration and the staffing configurations in the alternative models will be made. The project will attempt to arrange FPC processes to best meet the terminal and enabling objectives. Lastly, the project will determine the most cost effective (minimum cost) alternative that best matches HMEDDAC needs and the needs of the enrolled population. The scope is portrayed in the following illustration.

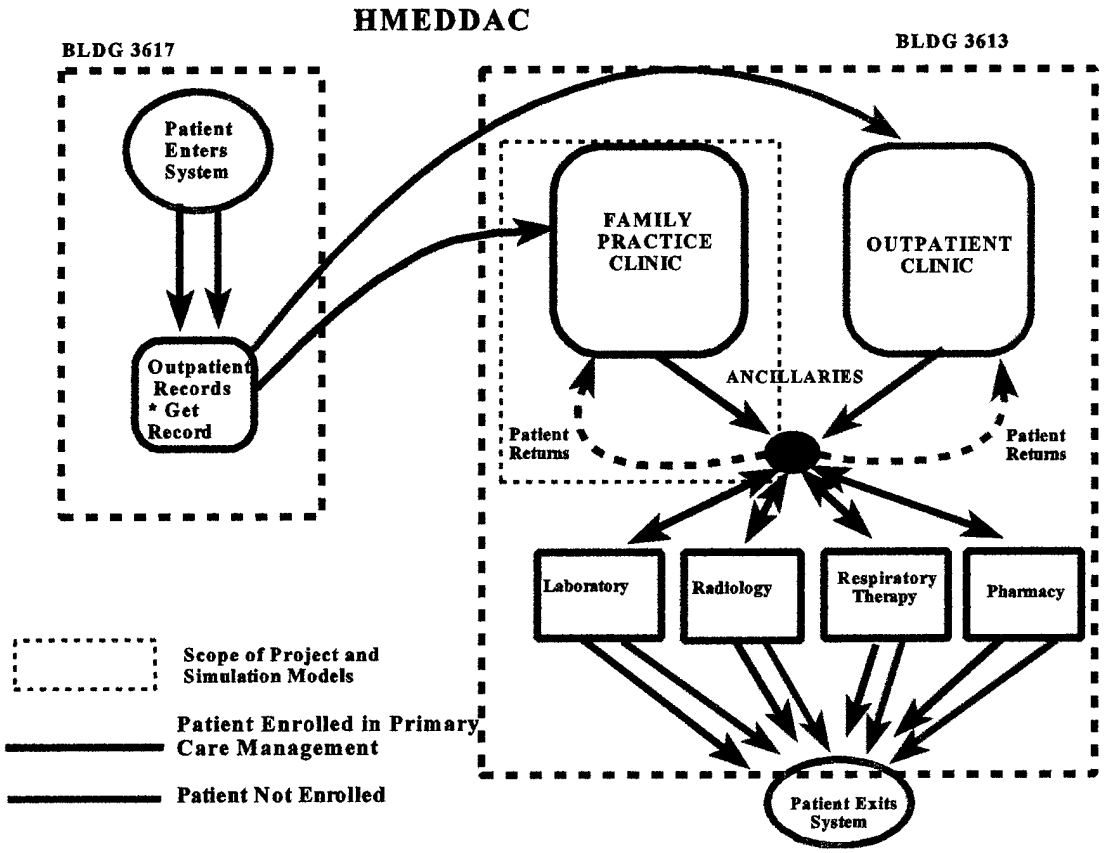


Figure 6. Project and Simulation Scope.

The project employed these assumptions.

- Observations gathered during the project represents the process throughout the year.
- The support staff required by PCPs will be resourced.
- Manual enrollee data (FPC) represents actual enrollment.
- Ancillary services can absorb additional workload based on FPC staffing changes.
- FPC provider service times will not significantly change.

- There is no difference between scheduled and walk-in patient groups.
- The facility can provide space for additional FPC resources.
- Material resources will be provided to meet FPC provider staffing needs.
- The enrolled beneficiary population, current and the goal population, utilize the FPC with no significant change from FY95 rates.
- FTE increases are filled by civilian hiring actions IAW USAREUR Civilian Personnel Office guidelines.
- Civilian grades are Step 5.

Simulation constraints follow:

- MedModel© Constraints (Student Version)
  - Maximum limits:
    - * 20 Locations
    - * 5 Resource Types
    - * 10 RTI Parameters
    - * 0 Prompt Statements
    - * 5 Entity Types
    - * 5 Attributes
    - * 0 Input Files
    - * 0 External Subroutines
- Other HMEDDAC activities outside the FPC system are not included in the model.
- 2d provider service time observations were not sufficient for Goodness-of-Fit testing; the arithmetic mean of 4.76 minutes and an absolute condition (constant 4.76 minute service time) will be used in simulation.
- There must be at least 1 physician per physician extender.

Level of Detail

The research effort requires a certain level of detail to provide sufficient response variables to assist in the decision to determine the acceptable terminal objective solution. All processes of routine FPC patients are included in the simulation. The provider staffing required to produce a sufficient number of patient visits, based upon the

enrollment goal (expressed as capacity = visits/year), varies depending on the simulation model. Capacity, in each simulation model, is isolated without regard to support staff or material resources. All patients were considered equal with no consideration for acuity or condition other than the observed variation in service times. The FPC system processes are modeled in simulation to include ancillary services utilized by FPC patients in the percentages observed in the empirical data. The simulation precision is .01 minutes.

Accuracy Required

The data utilized in the simulation models have various levels of accuracy. Patient process times, during the gathering of 101 patient flow timing observations, are accurate to the second. Interarrival times are accurate to the minute and were gathered (479 observations) from FPC reception sign-in sheets. The accuracy of the response variables are set to .01 minutes.

Observations and Data

Several methods were used to acquire empirical observations. Automated databases such as MEPRS, ASIP, and AQCESS provided summary data specific to the FPC. MEPRS data error is noted; historically, errors have been evident due to inaccurate input and haphazard use of cost drivers but MEPRS is the best current source of cost data for this project. USAREUR Revised FY 95 Army Composite Standard Pay Rates was the source of provider cost due to employment. Manual FPC records were used to acquire data on the current primary care management program enrollment. Patient flow

observations and current program enrollee data were obtained in the FPC in September 1995 - October 1995 by the author and Ms. Amanda Petrosky, Ohio University HMEDDAC Resident, Bachelor's Degree in Health Services Administration.

FPC current Family Practice Program enrollees' data was gathered manually. By reviewing each index card, the observers compiled information on family size, eligibility status, and aggregate numbers. The FPC maintains an automated database of enrollees but the system of records only identifies the eligible sponsor, not the total enrollment. The manual records compilation (by total families) and the FPC database (by total families) were equivalent.

Once the FPC process was understood, the observers began acquiring empirical data manually. The patient flow and timing tool is enclosed as part of Appendix 4. Times were kept by each observer using personal watches. One hundred and one (n=101) patient flow observations were acquired. The observations were gathered during several days, representing each day of the week, within the allotted timeframe. As one patient was timed through the system, the observers waited for the next patient to arrive and again initiated the timing process. The room (location of activity in the FPC process) doorframe was used as the point of timing for each process step. All patients were briefed on the timing procedure and the basic intent of the project. The observers received no objections to the timings. No patient identification data was included in the empirical data.

Interarrival rates were determined by manual FPC sign in records from 1994 and 1995, two sets from each quarter of the year, which resulted in four hundred and seventy-

nine (n=479) observations. Interarrival rate data was used to determine the theoretical distribution. The interarrival rate was varied in simulation to depict the most accurate throughput of patients. Patient flow, scheduling, procedures, and improvement suggestions were gathered by interacting, briefing, and interviewing FPC staff members. Descriptive statistics for patient flow times for each process/activity are presented as Appendix 5.

Observed FPC wait and service times distributions were compared to theoretical distributions using BestFit© software. Appendix 6 illustrates the BestFit© analyses. The "Goodness-of -fit" test, Chi^2 was used to select the best theoretical distributions that will be used in the MedModel© simulation models. All available theoretical distributions were tested. Sturges' Rule ($k = \lfloor 1 + 3.322 \log n \rfloor$) was used to determine the number of bins in the theoretical distribution testing. QuatroPro© spreadsheet software produced descriptive statistics on the acquired observation's distributions, ancillary service utilization rates (based on 101 observations), enrolled beneficiary FPC usage, the percentage of FPC provider clinic time, and enrolled versus non-enrolled population data. The data contributed to building the simulation models, and provided background clinic information. Data, ratios, costs, and sources are presented in Appendix 7. A summary of FPC time and condition dependent activity distributions and the representative theoretical distributions are listed in the next table.

Table 5. Distribution "Goodness-of-Fit" Summary

Activity	$\bar{x}$ Mean (minutes)	σ Std. Dev. (minutes)	Representative Theoretical Distribution	χ^2	χ^2 Critical Value $\alpha = .05$	df	# Bins Sturge's Rule
Patient Arrival	7.151	8.437	Lognormal 2	11.78	14.067	7	9
1st Wait Time	6.571	5.477	Pearson V	4.747	11.071	5	7
Screening Service Time	4.458	1.916	Pearson V	8.799	11.071	5	7
2d Wait Time	14.441	12.6	Gamma	4.622	11.071	5	7
Provider Service Time	16.137	8.81	Pearson VI	5.656	11.071	5	7
Total Time	41.61	16.722					

*NOTE: Terminating simulation patient arrivals are modeled using the same arrival mean and standard deviation as the NonTerminating simulation for each model unless stated as revised.

Acceptable HMEDDAC FPC staffing alternatives were derived from an informal questionnaire. Informal questionnaires were given to Executive Committee members, the Chief and Head Nurse of the Primary Care Department, and to the FPC staff. Results and the questionnaire are located as part of Appendix 4.

Models Simulated

Three models were simulated. The initial model represents the status quo of the FPC. Alternative models are based on the status quo model with specific changes to support terminal subordinate objectives and the terminal objective. The two alternative models represent an all physician model and a combination (a physician and physician extender mix) model. The combination model was derived by using the QuatroPro©

spreadsheet functions with regard to certain constraints (such as 1 physician must be on the FPC staff for each physician extender) and based on minimum annual provider cost. Both alternatives were modeled in the newly renovated FPC area. The alternative models capacity (visits/year) differ. The Physician MedModel© requires 48,372 annual visits and the Combination MedModel© requires 51,033 annual visits. The Combination MedModel© requires more visits due to physician extender internal referrals of patients to the physicians. The literature suggests that 12% of physician extender patients require an internal referral to a physician. Models utilized are described in the following table.

Table 6. FPC Simulation Models and the Terminal Objectives and Sub-Objectives.

Simulation Model	**Change from Status Quo Model**	**Terminal Sub-Objective Reference**	**Analysis Required for Terminal Objective**
Status Quo MedModel©	N/A	Performance Analysis Capacity Analysis Capability Analysis	Model Verification & Model Validation
Physician MedModel©	Increase Physicians at 1:1300 enrolled beneficiaries to service all AD and ADFM	Capacity Analysis Capability Analysis Comparison Analysis to Other MedModels© * Renovated FPC Area	Is Capacity ≥ 48,372 visits/year (4.699 visits per enrollee/year)? Lowest Cost?
Combination MedModel©	Include NPs and PAs into the FPC model at 1 per 1000 (.8 FTE) beneficiaries. The .8 FTE figure is based upon literature research. Constraint: Must have 1 physician for every physician extender.	Capacity Analysis Capability Analysis Comparison Analysis to Other MedModels© * Renovated FPC Area	Is Capacity ≥ 51,033 visits/year (4.699 visits per enrollee/year and this model requires an additional 2661 visits due to extender internal referrals to Physicians)? Lowest Cost?

The modeling process is a series of feedback (cybernetic) processes. This methodology allows the project to model the environment as closely as possible. Figure 7 illustrates this process for a simulation modeling project.

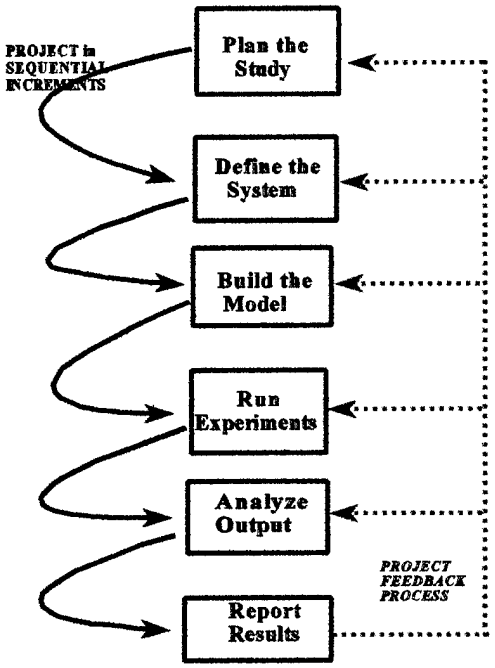


Figure 7. Simulated Modeling Process.
Source: MedModel© User's Guide, PROMODEL Incorporated, Orem, Utah, 1995. Pg. 47.

Model Verification

Verification of the Status Quo MedModel© involves various procedures. The model is built in incremental steps. Each FPC activity is built, patients are included, and the model is run. After a successful "base" model is constructed, additional entities, locations, and resources are added. Model Verification will follow these steps:

1 Program in increments.

2 Expand the base model to proper configuration.

3 Use MedModel© Debugger & Trace Features.

4 Conduct a structured model walk- through with the Family Practice Clinic Staff.

Model Validation

Model validation ensures that the simulation model reflects reality in the modeled environment. Model validation information is presented in Appendix 8. The steps utilized in model validation are:

1 Establish face validity; from author and FPC Staff.

2 Non-terminating simulation; determine warm-up period.

3 Gather response variables.

4 Conduct BestFit© Chi² "Goodness- of- Fit" tests of wait time distributions.

5 Conduct Pair-Wise t tests of means between empirical and response variables.

6 Establish credibility of the model.

Type of Experimentation

The following parameters were set for simulation experimentation:

- Alpha level is $p \leq = .05$.
- MedModel© response variable data collection was set at .01 minutes.
- Run length = 1 year or 2080 hours (DoD Standard: USAREUR Circular 37-11, Change 1) for NonTerminating simulations and 1 day (by clinic schedule) for Terminating simulations.
- NonTerminating simulation warm-up period = 120 hours.
- Replications = 101.

With regard to terminating and non-terminating simulations, both experimentation methodologies were used. Table 7 illustrates the response variables tested and methodology used.

Table 7. Experimentation Method Utilized by Hypotheses Tested.

Response Variable	Terminating Simulation	Non-Terminating Simulation
Patient Visits per Year (48,372 required)	X	
Provider Utilization Rates	X	
Mean of 1st Waiting Time		X
Mean of Screening Service Time		X
Mean of 2d Waiting Time		X
Mean of Provider Service Time		X
Mean of Patient Total Time in FPC System		X

Terminating simulation starts and ends at defined states or times. In this case, terminating simulation was used for capacity (patient visits ≥ 48,372). With terminating simulations, utilization rates are more meaningful than activity time means. In MedModel©, varied arrival rates (using the same interarrival rate theoretical distribution as determined from FPC sign-in sheets) were used to develop the model to accurately portray the system and analyze capacity. The arrival rate was increased in the alternative models to reach (or exceed) the capacity needed under the enrollment goal.

NonTerminating simulation requires the establishment of a steady-state behavior in the system. To ensure the steady-state, a warm-up period was determined. The method described by Law and Kelton (1991) was used; several preliminary replications

were run to find the time (simulation time) when "the model reached statistical stability by monitoring response variables."[48] A plot of the response variables was used to assist in locating the time (simulation time) that the steady-state behavior began. After the steady-state is determined, thirty percent was added to the steady-state time to ensure an adequate warm-up period. A one hundred and twenty hour warm-up period was utilized. One hundred and one replications of one year (2080 hours) simulation runs should be sufficient to include every type of event. NonTerminating simulation waiting times can be considered as worst case or wait time at full operation.

Form of Results

Results of simulation (response variables) are in descriptive statistical form with an associated graph. The variables are aggregated from 101 replications. The graphs were produced by the MedModel© program. Descriptive and inferential statistics were produced and run on QuatroPro© spreadsheet software.

Statistical Test

The response variables and associated hypotheses were tested by the inferential statistical test called Analysis of Variance (ANOVA), an omnibus test of means. If significance ($p \leq .05$) was found, a Pair-Wise t Test of Means was used to isolate the significant differences. If the ANOVA results were significant, only the Pair-Wise t Test of Means was reported.

RESULTS & DISCUSSION

The project determined the optimal HMEDDAC FPC provider staffing and process configuration to best service the target population for primary care enrollment. The optimal provider staffing must be the alternative that can provide sufficient patient visits/year with significant consideration given to provider aggregate annual cost. In order to adequately service the enrolled goal, the FPC must have an annual capacity of 48,372 visits. The Status Quo MedModel© cannot meet the annual patient visit goal. The Physician MedModel© requires eight FTE Family Practice Physicians to meet the goal (at 1300 enrollees per provider). The Combination MedModel© requires five Family Practice Physicians and four Physician Extenders to meet the goal (at 1300 enrollees per provider and Physician Extenders considered .8 a FTE).

The alternative models, the Physician MedModel© and the Combination MedModel© , were modeled in the new FPC area. All time and condition dependent variables for the alternative models were identical to the Status Quo MedModel© . The screening service distribution, mean, and standard deviation remain the same in all models yet the screening process was changed in the alternative models from a serial process to a parallel process.

The alternative models were simulated using a the quasi-parallel screening process. Under the quasi-serial screening method (the method used in the Status Quo MedModel©), the alternative models perfomed below requirements: provider utilization

rates were under 65%, and the required capacity of 48,372 visits for the Physician MedModel© and 51,033 visits for the Combination MedModel© could be met only if waiting times exceeded twelve minutes for the first wait and fifteen minutes for the second wait. Also, the clinic hours would have to be expanded considerably to reach the required capacity using the quasi-serial screening method. The increased wait time and the low utilization rates of the providers were unacceptable without investigating other methods to improve the screening process. Edwards et al. determined that implementing quasi-parallel processes decreased patient waiting times. The change simply allowed for screening within the exam rooms rather than in a separate screening area. The change does imply that the FPC screening personnel must move from patient to patient instead of the patients coming into a screening area. This change is more patient-focused and improves patient privacy and confidentiality; better reflecting the organization's vision statement. In the alternative models, modeled in the renovated FPC area, each provider has two exam rooms to work in; facilitating the screening process change. The Status Quo MedModel© allowed one exam room per provider, representing reality in the current FPC area. Consulting with the Chief of the FPC, this screening process change is a reasonable clinic improvement. To show the differences in the alternative models refer to Table 8.

Table 8. Alternative FPC Models.

Resource/Process	**Physician MedModel©**	**Combination MedModel©**
Quantity of Physicians	8	5
Quantity of Physician Extenders	0	4
Screening Process	Quasi-Parallel	Quasi-Parallel
Exam Process	Screening in Exam Room	Screening in Exam Room
% Patients to Physician Extenders	N/A	45% Extenders = .8 FTE for staffing; out of 9 providers, 4 extenders service 45% of patients.
Quantity (%) Internal Patient Referrals (thus increasing the capacity of annual visits required)	0 (0%)	2661 (5.5%) *Note: 12% of extender patients are referred to Physicians.
Annual Cost Attributed to Providers (in Dollars)	$777,688	$742,059
Annual Cost Attributed to Providers (Cost/Enrolled Beneficiary)	$75.55	$72.09

Model Verification & Performance

The Status Quo MedModel© represents a valid and credible model. Appendix 8 details the results of the Status Quo MedModel© validation process. Although the First Wait Time response variable and the input variable were significantly different ($t = 3.78$, df (100), $p=.0026$), the other response variables and input variables were not significantly different. The total patient time in the FPC, tested by a Pair-Wise t Test, and the input data were not significantly different ($t=.04$, df(100), $p=.97$). In order to produce response

variables for the First Wait Time that would not be significantly different from the input variables, both the Screening Service Time and Second Wait Time would have to be increased and decreased respectively. The slightly more than two minute difference (between the First Wait response variable at 4.49 minutes and input variable at 6.57 minutes) was a modeling necessity. As expressed in the literature, Law and Kelton suggest that environments cannot always be modeled exactly. The first wait difference was possibly due to travel time in the simulation model or the lower variance in the response variables. This actually shows the FPC in a more favorable position in the model. If the alternative models are significantly improved, with regard to First Wait Time, then the alternatives are more improved than the simulation shows. Although one variable was significantly different, all other variables and the total patient time in the FPC were not significantly different. The FPC staff deemed the model credible and thus a valid representation of the FPC environment.

Appendix 8 lists the summarized Status Quo MedModel© data as part of the model validation process that failed to reject the Ho and resulted in a valid model with which to derive alternative solutions. Since the FPC status quo has been modeled validly and credibly, does the current status of resources and process configuration meet the required capacity (in patient visits per year) for the enrollment goal? From the terminating simulation, the answer is definitely no. The number of patient visits, with an aggregate provider utilization mean of 82.61% (from simulation response variables), is 36,732. Since the goal is 48,372 annual patient visits; the shortfall is 11,640 visits. The provider utilization rate leaves little chance for the status quo to overcome the visit

shortfall by changing FPC processes to realize greater provider utilization and thus increase capacity. The existing FPC cannot meet the capacity needs of the enrollment goal.

The hypothesis test result is **FAILURE TO REJECT Ho**. The hypothesis is:
Ho: There is no significant difference between the FPC Status Quo MedModel© and the empirical data.
Ha: There is a significant difference between the FPC Status Quo MedModel© and the empirical data.

This result allows alternative models to be used based on the Status Quo MedModel©.

Model Capacity & Performance

Comparing the Status Quo MedModel© to the alternative models, based on descriptive statistics and Pair-Wise t Test of Means, proves that the alternatives are significantly different from the status quo. Both alternatives can support the enrollment goal based on annual visit capacity. The Combination MedModel©, due to internal referrals that requires 2661 more annual visits than the other alternative model, has a slight shortfall (686 visits) of annual visits. Both alternative models have the Second Wait Time in the Exam Room based upon the quasi-parallel model suggested by Edwards et al. The Combination MedModel© provider utilization and patient visits are a combination of the physician and physician extender rates and visits respectively. The ANOVA showed significance and thus, Pair-Wise t Tests of Means were performed. It is important to note that due to the high number of replications simulated (n=101), even slight differences will be more likely to show significance. Table 9 compares the status quo and the alternative models.

Table 9. Status Quo MedModel© Comparison to the Alternative Models.

Process/ Capacity or Rate	$\bar{x}$, σ Status Quo Physician Model Combination Model	Status Quo and Physician Model t,df, p = t critical =1.98	Status Quo and Combination Model t,df, p = t critical =1.98	BEST: * Lowest Wait * Fastest Serv Time * Largest Capacity * Highest Provider Utilization
Annual Patient Visits (Capacity)	36,732; 11.9 48,383; 14.44 50,347; 18.97	107.21,df=100 p=0.000 **Significant Difference**	71.44,df=100 p=0.000 **Significant Difference**	**Physician Model (Combination Model has visit shortfall)**
First Wait Time	4.49, 0.41 11.71, 1.58 4.49. 0.31	61.52, df=100 p=0.000 **Significant Difference**	0.47,df=100 p=0.64	**Status Quo & Combination Model**
Screening Service Time	4.76, 0.01 4.66, 0.01 4.66, 0.01	213.27, df=100 p=0.000 **Significant Difference**	199.67, df=100 p=0.000 **Significant Difference**	
Second Wait Time	15.54, 1.7 7.57, 0.23 3.39, 0.13	54.48, df=100 p=0.000 **Significant Difference**	77.93, df=100 p=0.000 **Significant Difference**	**Combination Model**
Provider Service Time	16.88, 0.07 16.88, 0.05 16.89, 0.07	2.75, df=100 p=0.01 **Significant Difference**	7.19, df=100 p=0.01 **Significant Difference**	
Patient Total Time in the FPC	41.67, 2.18 40.82, 1.87 29.66, 1.21	22.71, df=100 p=0.000 **Significant Difference**	64.37, df=100 p=0.000 **Significant Difference**	**Combination Model**
Provider Utilization Rate	82.61%, 5.3% 72.01%, 6.86% 66.41%, 7.76%	56.33, df=100 p=0.000 **Significant Difference**	61.60, df=100 p=0.000 **Significant Difference**	**Status Quo Model**

The hypothesis summaries follow. Figure 8, on the next page, compares the three model process means. Also, Appendixes 9 through 11 contain additional details.

Appendix 9 details the comparison between the Status Quo MedModel© and the Physician MedModel©. The alternative model NonTerminating and Terminating graphics are also included in the appendix. The hypothesis summary follows.

Ho A: There is not a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ha A: There is a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Reject Ho and Accept Ha. Note; The Status Quo MedModel© Provider Utilization Rate of 82.6% was significantly higher than the FPC Physician MedModel©. Based upon expanding capacity, the Status Quo MedModel© provider utilization rate leaves little chance to increase capacity by creating provider efficiencies. The FPC Physician MedModel© provider utilization rate mean of 72% allows for some expansion of capacity in the model. An important factor in increasing capacity is provider utilization. The higher the provider utilization rate, the less chance capacity can be increased.

Appendix 10 details the comparison between the Status Quo MedModel© and the Combination MedModel©. The alternative model NonTerminating and Terminating graphics are also included in the appendix. The hypothesis summary follows

Ho B: There is not a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ha B: There is a significant difference (100% beneficiary enrollment goal)

between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Reject Ho and Accept Ha. Note; The Status Quo MedModel© Provider Utilization Rate of 82.6% was significantly higher than the FPC Combination MedModel©. Based upon expanding capacity, the Status Quo MedModel© provider utilization rate leaves little chance to increase capacity by creating provider efficiencies. The FPC Combination MedModel© provider utilization rate mean of 66.4% allows for some expansion of capacity in the model.

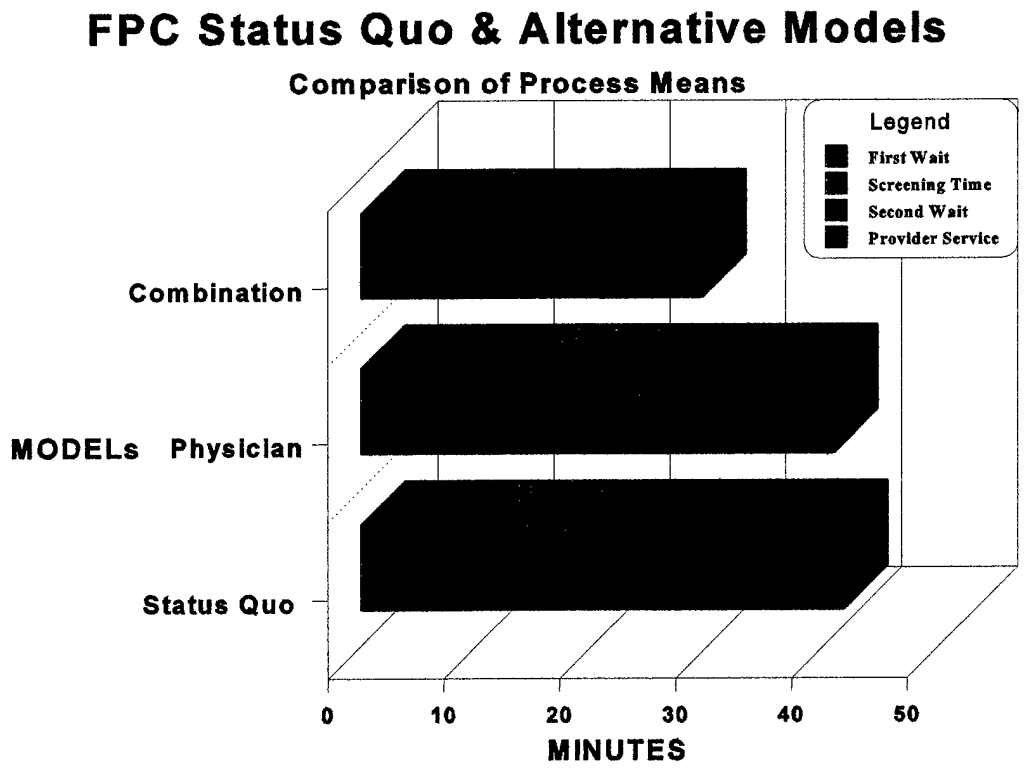


Figure 8. Comparison of Three Model's Process Means.
Source: MedModel© Simulation Response Variables.

Model Comparison

The comparison of the two alternative models resulted in a significant difference between the Physician MedModel© and the Combination MedModel©. Table 10 summarizes the results.

Table 10. Comparison of the Physician MedModel© and Combination MedModel©.

Process/ Capacity or Rate	Physician MedModel© $\bar{x}$, σ	Combination MedModel© $\bar{x}$, σ	Pair=Wise t Test of Means; t, p= df=100, Critical t=1.98	Best for FPC
Annual Patient Visits (Capacity)	48,383; 14.44 (48,372 req'd)	50,347; 18.97 (51,033 req'd)	t = 17.43, p = 0.001 Significant Difference	Physician Model
First Wait Time	11.71, 1.58	4.49, 0.31	t = 56.75, p = 0.000 Significant Difference	Combination Model
Screening Service Time	4.66, 0.01	4.66, 0.01	t = 1.19, p = 0.24	
Second Wait Time	7.57, 0.37	3.39, 0.13	t = 418.68, p = 0.000 Significant Difference	Combination Model
Provider Service Time	16.88, 0.05	16.89, 0.07	t = 7.33, p = 0.005 Significant Difference	Physician Model
Patient Total Time in the FPC	40.82, 6.86	29.66, 1.21	t = 61.60, p = 0.000 Significant Difference	Combination Model
Provider Utilization Rate	72.01%, 6.87%	66.41%, 7.76%	t = 47.52, p = 0.000 Significant Difference	Physician Model
Total Provider Annual Cost	$777,688	$742,059	N/A	Combination Model

The results of the hypothesis of the model comparison follow.

Ho C: There is no significant difference (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ha C: There is a significant difference (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Reject Ho and Accept Ha. The lowest cost (annual cost attributed to the providers) option is the Combination MedModel© but the Combination MedModel© must be adjusted to account for additional visits caused by physician extender referrals (total of 12% of extender patients) to physicians.

The Combination MedModel© represents a feasible provider staffing and process configuration for the FPC. This alternative has the lowest annual cost attributed to providers at $742,059 or $72.09 per enrollee. The annual visit requirement may be misleading in the Combination MedModel©. Since this model employed five physicians and four extenders, more visits are required. According to the literature, approximately 12% of patient visits produced by physician extenders require a follow-on visit with a physician. With this in mind, the new visit requirement should be 51,033 annual visits. This leaves a small shortfall of 686 annual visits in the model. Using the same model with increased patient arrivals, (running five replications to see the preliminary result) the model produced additional visits (to overcome the shortfall) with increased total wait time of 2 to 3 minutes. Considering the provider utilization rate for the Combination MedModel©, a composite mean of 66.41%, efficiencies can be gained to increase utilization to overcome the shortfall. Some considerations for increasing provider

utilization are: using a dictation system rather than hand writing visit information, employing automated patient records and ancillary service support systems such as CHCS, and decreasing the administrative burdens that the providers have by resourcing an administrator in the FPC. The question is, are the additional visits more costly (variable cost which is cost that changes due to volume) than the $35,629 savings when comparing this model to the Physician MedModel©? Also, are one time costs attributed to changing to a physician and physician extender mixed clinic (credentialing and privileging, developing protocals, marketing efforts to the beneficiary population, and educating physicians on extender supervision responsibilities) worth the change? These issues will be discussed later in this section.

The Physician MedModel© met the annual patient visit requirement (48,372 visits required; 48,383 mean visit capacity in model). The annual cost attributed to providers exceeded the other alternative model by $35,629. Also, patient wait times were significantly greater than in the Combination MedModel© (19.28 minutes compared to 7.87 minutes). The wait time difference is attributed to the additional provider (9 in the Combination MedModel© versus 8 in the Physician MedModel©) and the two additional exam rooms that are used by the additional provider. The addition of the provider and two exam rooms increases the throughput rate of patients and is the reason for the wait difference. The Physician MedModel© is a feasible solution for the FPC.

Due to the variable cost associated with 2661 more visits and the one time cost of introducing physician extenders into the FPC, the Combination MedModel©, a possible

alternative, must be closely scrutinized. The variable cost (from MEPRS data) is $13.65 per visit for the FPC. The MEPRS variable cost is a conservative estimate that only considers costs attributed to the number of visits (volume). Since the Combination MedModel© requires 2661 more annual visits than the Physician MedModel© for the same number of enrolled beneficiaries, the annual relevant variable cost of the additional visits is $36,322.65. Annually, when compared to the possible cost avoidance potential of $35,629 for implementing the Combination MedModel© rather than the Physician MedModel©, the Combination MedModel©'s relevant aggregate variable cost/visit adds $693.65 to the FPC cost. In comparison, both alternative models are relatively equal in cost with a slight advantage in cost avoidance for the Physician MedModel©.

Provider utilization rates for the alternative models (72% and 66.4%) warrant further discussion. The rates are significantly lower than the Status Quo MedModel© rate (82.6%) and the author's expectations. There are several reasons for the low utilization: providers waiting for the patient screening process to finish before beginning the exam, lack of more exam rooms for the providers to work in, and provider travel time between exam rooms. Providers waiting for patients to be screened seems to be the major contributor to the inefficiency. This issue could be resolved by adding screening staff to the process so that providers do not wait between patients. This is a resourcing decision best handled at the clinic level by the clinic management but a simulation model would assist in deciding the best number of screeners to employ.

CONCLUSIONS and RECOMMENDATIONS

Both alternatives can meet the needs of the FPC. Either option could be employed depending on HMEDDAC leadership concerns, provider availability, and beneficiary satisfaction interests. Table 10, on the next page, compares the alternative models. The literature and the HMEDDAC staff (Executive Committee, Nursing Staff, and FPC Staff surveyed in the Subject Matter Expert Questionnaire) suggest that employing nurse practitioners and physician's assistants in primary care is an option with considerable value to the organization. If decreased patient wait times are paramount to patient satisfaction, then the Combination alternative is a realistic and recommended option. If extender availability is low or HMEDDAC beneficiaries put greater value in physician provided care, then the Physician option is recommended. Regardless of the option, the provider staff mix that is selected should be configured before the enrollment goal is met. Utilizing a quasi-parallel screening process (screen in exam room) increased efficiency and should improve patient satisfaction.

The Physician MedModel© and the Combination MedModel© met the criterion of the project. Both options are acceptable alternatives for the HMEDDAC leadership. The options produce sufficient annual visits, although the Combination MedModel© will need minor adjustment to meet the visit goal. Since both options are feasible, HMEDDAC has the management flexibility to employ either alternative. The FPC should plan to implement quasi-parallel screening as a clinic process improvement. A decision matrix, Table 11, expresses the logic of the situational recommendation. There are additional recommendations in the peripheral observations located in Appendix 12.

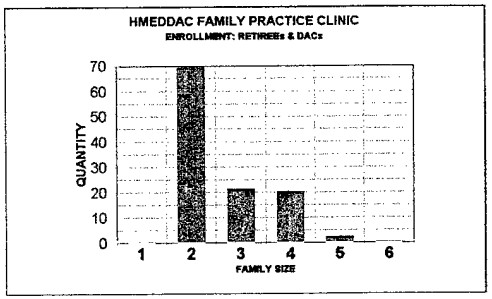
Table 11. Decision Matrix.

Alternative Models	Annual Capacity in Visits	Provider Utilization Rate	Relevant Cost (includes Variable Costs)	HMEDDAC Acceptance	Total Wait Time (first and second wait)
Physician Model	48,383	0.7201	$777,688	YES	19.28 min
Combination Model	50,347	0.6641	$769,017.75	YES	7.87 min
Combination Model (Adjusted)	51,033	Approximately 0.6827	$778,381.65	YES	Approximately 10 min
Recommendation	**Physician**	**Physician**	**Relatively Equal**	**Relatively Equal**	**Combination**

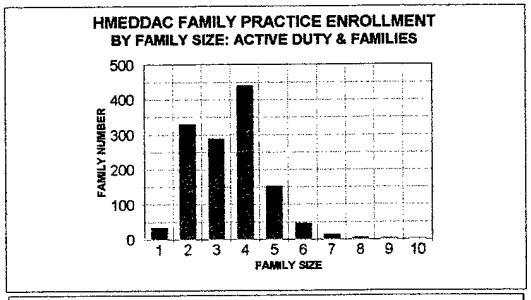
Having discussed the viability of both options, **the recommended option is the all physician model, expressed in simulation as the Physician MedModel©**. Although the relevant cost of the decision, isolated in the FPC, is relatively equal, the costs and efforts associated with implementing physician extenders into the staff in areas such as internal and external marketing, privileging, physician supervision, and extender acquisition make the all physician model the best choice for the HMEDDAC. Another vital consideration is time. The time to execute the enrollment program is short and physician availability is greater in Europe than physician extender availability. The FPC management and staff should strive to reduce patient waiting times as a short term objective. Also, once efficiencies (specifically provider utilization and increased patient throughput) are gained, excess capacity may be available to include the retiree beneficiary population in the Family Practice Program and/or target market pay patients (DACs). DACs could be targeted as a marketing opportunity in the FPC if excess capacity is available and as long as variable costs are covered thus increasing the HMEDDAC contribution margin.

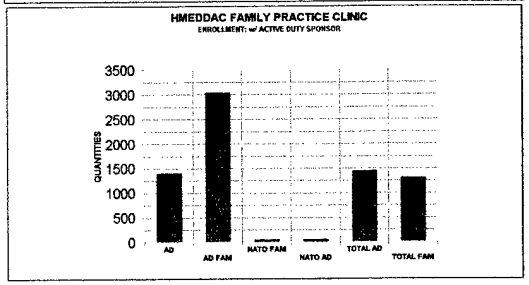
HMEDDAC FPC: Primary Care Management Program Enrolled Population

RETIREE MEMBERS	RETIREE FAMILY MEMBERS	Dept Army CIVILIANS	Dept Army CIVILIAN FAMILY MEMBERS	TOTAL FAMILIES
115	178	1	1	112



ACTIVE DUTY MEMBERS	ACTIVE DUTY FAMILY MEMBERS	NATO FAMILIES	NATO ACTIVE DUTY MEMBERS	TOTAL ACTIVE DUTY	TOTAL FAMILIES
1391	3028	39	40	1431	1293





HMEDDAC FAMILY PRACTICE ENROLLMENT BY FAMILY SIZE (Sponsor Included)

1	2	3	4	5	6	7	8	9	10
0	69	21	20	2	0	0	0	0	0

RETIREE AND DAC SPONSORED ENROLLEES

Mean	**2.60**
Std Error	0.08
Median	2.00
Mode	2.00
Std Deviation	**0.84**
Variance	0.71
Kurtosis	-0.20
Skewness	1.06
Range	3.00
Minimum	**2.00**
Maximum	**5.00**
Sum	291.00
Count	112.00
Conf Level (0.950)	0.16

****Note: Data represents Retiree & Dept of the Army Civilian Sponsored Families Enrolled in HMEDDAC Family Practice Program A Sponsor represents a Family eventhough the beneficiary is single, on an unaccompanied tour, or has dependants.

HMEDDAC FAMILY PRACTICE CLINIC ENROLLMENT BY FAMILY SIZE

1	2	3	4	5	6	7	8	9	10
31	328	286	437	151	43	12	3	2	0

ACTIVE DUTY & FAMILIES (Includes NATO)

Mean	**3.44**
Std Error	0.04
Median	4.00
Mode	4.00
Std Deviation	**1.25**
Variance	1.56
Kurtosis	0.35
Skewness	0.46
Range	8.00
Minimum	**1.00**
Maximum	**9.00**
Sum	3484.00
Count	1013.00
Confid Level (0.950)	0.08

****Note: Data is AS OF 5 October 1995.

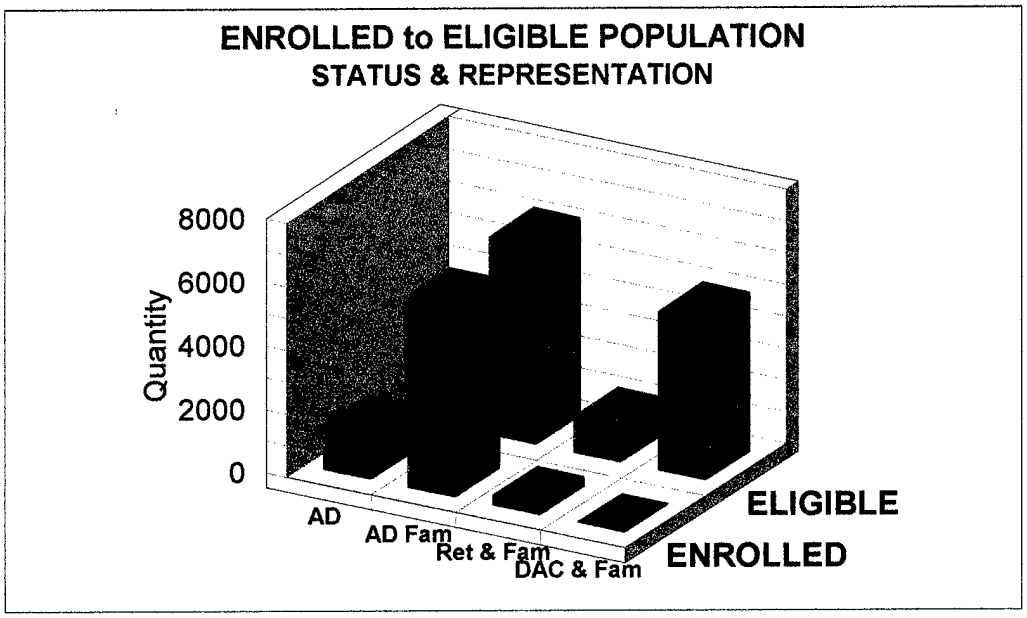
****Note: Data represents Active Duty Sponsored Families Enrolled in HMEDDAC Family Practice Program An Active Duty Sponsor represents a Family eventhough the beneficiary is single, on an unaccompanied tour, or has dependants.

APPENDIX 1-1

HMEDDAC FPC: Primary Care Management Program Enrolled versus Nonenrolled Population

CURRENT ENROLLMENT

TOTAL ENROLLMENT		TOTAL FAMILIES	
Active Duty	1431	Active Duty	1293
AD Fam	3028	Sponsored	
Retirees	115	Retirees	112
Retiree Fam	178	Sponsored	
DAC	1	DAC	1
DAC Fam	1	Sponsored	
TOTAL	4754	TOTAL	1406



PRIORITY	ENROLLMENT DELTA	TOTAL ENROLLED POPULATION	TOTAL ELIGIBLE POPULATION			
			ACTIVE DUTY	AD FAMILY	RETIREEs & FAMILY	DAC & FAMILY
1	2346	1431	3777			
1	3194	3028		6222		
2	843	293			1136	
3	5003	2				5005

	ENROLLMENT DIFFERENCE		
TOTAL	11386	All Beneficiaries	
PRIORITY 1 TOTAL	5540	AD & ADFMs	GOAL
PRIORITY 1 + 2 TOTAL	6383	Includes Retirees & FMs	

*Note: As of 5 October 1995

Sources: FPC Manual Enrollment Records
ASIP Population Data; 11 Sept 1995

HMEDDAC FPC: Provider Availability for Patient Care

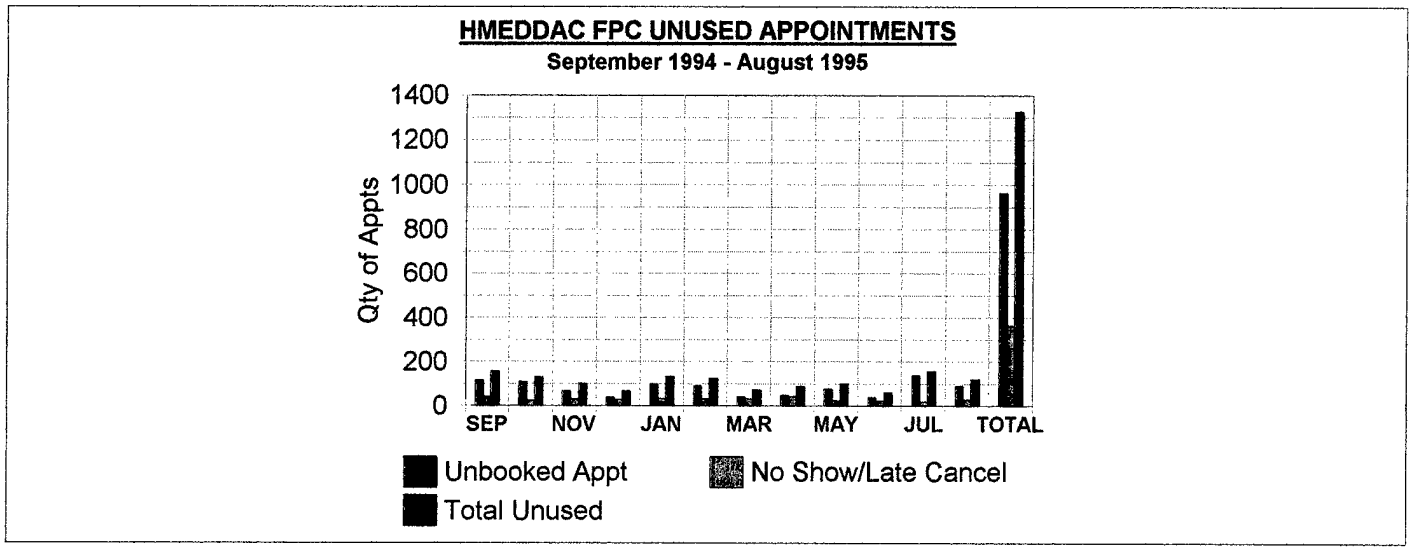
SEP 94 - AUG 95 MONTH	PROVIDER ZBYLSKI %Time in Clinic	GOODRICH %Time in Clinic	OLSEN %Time in Clinic	MILLER %Time in Clinic	CHU %Time in Clinic	CAMARATA %Time in Clinic	TORRANCE %Time in Clinic	MALINER %Time in Clinic
SEP	75.68	75.68	21.62	67.57		56.76	51.35	
OCT	75.76	63.64	66.67	57.58		36.36	90.91	
NOV	71.43	34.29	71.43	71.43		11.43	88.57	
DEC	21.43	78.57	78.57	60.71			78.57	
JAN	80.00	74.29	85.71	77.14			94.29	
FEB	94.12	41.18	85.29	85.29			58.82	
MAR	97.67	86.05	69.77	97.67			55.81	
APR	69.70	48.48	63.64	81.82			42.42	
MAY	62.50	87.50	72.50	80.00			77.5	
JUN	84.62	25.64	58.97	35.90			97.44	
JUL	88.89	66.67	66.67				16.67	
AUG	92.50	92.50	17.50		42.50			70.00

FPC PROVIDER % TIME in CLINIC	Measurement Unit % Work Day
Mean	**70.0795**
Standard Error	2.3772
Median	71.9650
Mode	66.6700
Standard Deviation	**18.7184**
Variance	**350.3794**
Kurtosis	-0.0173
Skewness	-0.7074
Range	**76.0500**
Minimum	**21.6200**
Maximum	**97.6700**
Sum	4064.6100
Count	58.0000
Conf Level (0.950)	4.8173

Assumption: Providers with LESS THAN 20% Time in Clinic are Considered ASSIGNED OUT of THE FPC

APPENDIX 1-3

HMEDDAC FPC: Provider Appointment Utilization & Yearly Rates Summary



FY95 FP CLINIC VISITS per YEAR (Includes Phone Consultations)	TOTAL FPC ENROLLMENT (All Categories)
22339	4754
VISITS per BENEFICIARY per YEAR	4.6990

***Note: Sep 95 Data Unavailable; Sep Figure is Average of 11 Preceeding Months

Source: AQCESS FPC Extract Data & FPC Enrollment Data

MONTH	UNBOOKED APPOINTMENTS	NO SHOW/ LATE CANCEL	TOTAL UNUSED APPOINTMENTS
SEP	116	41	157
OCT	108	24	132
NOV	69	33	102
DEC	39	30	69
JAN	100	34	134
FEB	93	33	126
MAR	42	32	74
APR	48	43	91
MAY	77	24	101
JUN	40	22	62
JUL	139	19	158
AUG	92	30	122
TOTAL	**963**	**365**	**1328**
MONTHLY AVERAGE	80.2500	30.4167	110.6667
POTENTIAL INCREASE ATTRIBUTED to INCREASED EFFICIENCY	17.0781	6.4730	282.6139

***Based on 4.699 Visits per Beneficiary per Year*

APPENDIX 1-4

HMEDDAC FPC: Patient Ancillary Utilization Summary

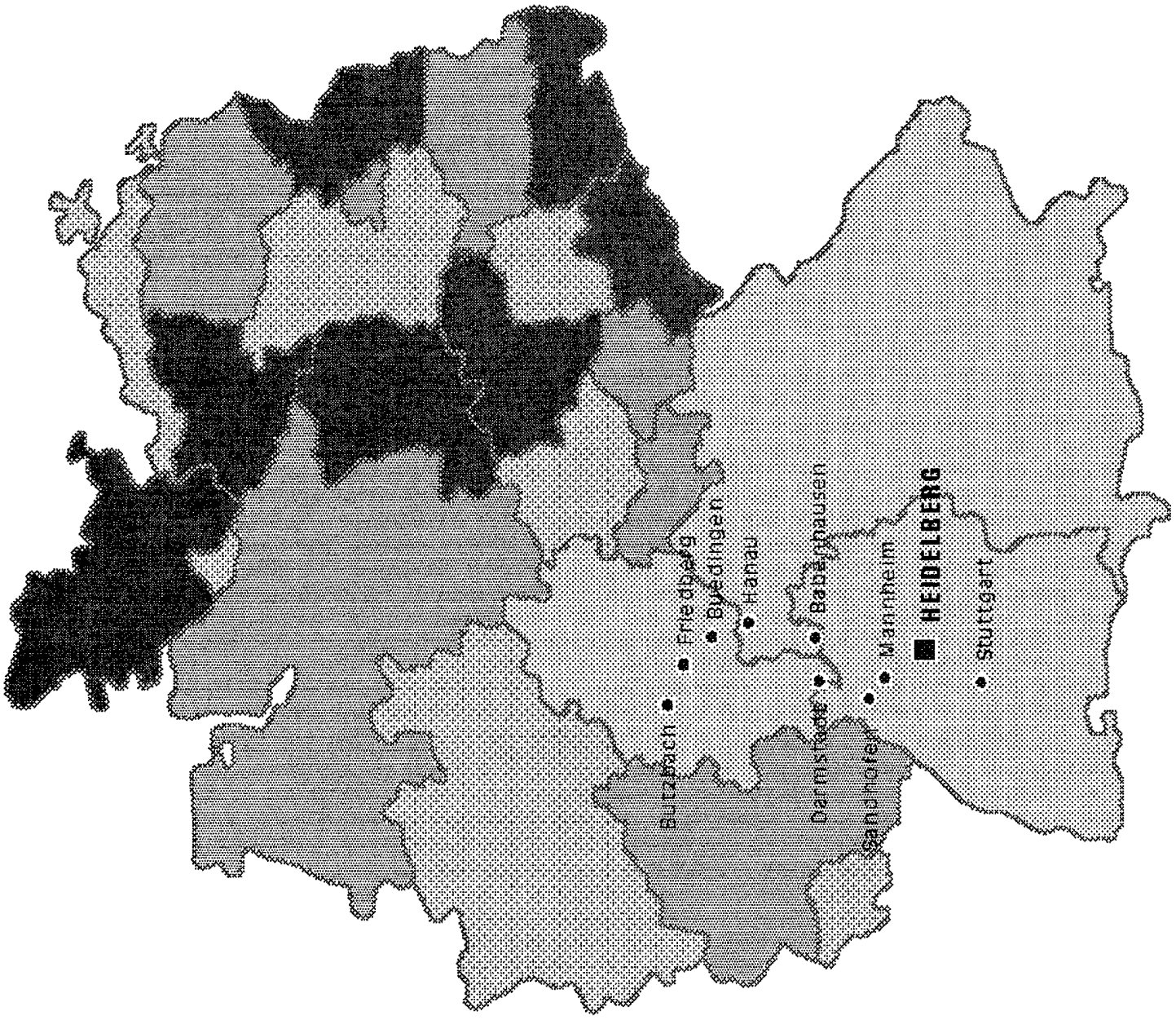
	LABORATORY	RADIOLOGY	RESPIRATORY THERAPY	PHARMACY	POST ANCILLARY RETURN to FPC	PATIENT RETURN to DIFFERENT PROVIDER
TOTAL	10	8	0	72	5	0
% of Observations	**9.90%**	**7.92%**	**0.00%**	**71.29%**	**4.95%**	**0.00%**

2d PROVIDER SERVICE TIME Patient Returns from Ancillary Service	Measurement Unit Minutes
Mean	**4.7567**
Standard Error	1.2550
Median	3.8333
Mode	NA
Standard Deviation	**2.8064**
Variance	**7.8756**
Kurtosis	4.0988
Skewness	1.9516
Range	**7.1000**
Minimum	**2.5500**
Maximum	**9.6500**
Sum	23.7833
Count	5.0000
Confidence Level (0.950)	2.4598

APPENDIX 1-5

U.S Army Medical Department Activity
Heidelberg Catchment Area

North



APPENDIX 2

MODEL VERIFICATION & PERFORMANCE

Model verification ensures that the animated computer simulation model represents the modeled environment. The inferential statistical test must reveal no significant difference between the empirical data and the Status Quo MedModel©.

Ho: There is no significant difference between the FPC Status Quo MedModel© and the empirical data.

Ha: There is a significant difference between the FPC Status Quo MedModel© and the empirical data.

Ho 1: There is not a significant difference in first wait time between the FPC status Quo MedModel© and the empirical data.
Ha 1: There is a significant difference in first wait time between the FPC status Quo MedModel© and the empirical data.

Ho 2: There is not a significant difference in screening service time between the FPC status Quo MedModel© and the empirical data.
Ha 2: There is a significant difference in screening service time between the FPC status Quo MedModel© and the empirical data.

Ho 3: There is not a significant difference in second wait time between the FPC status Quo MedModel© and the empirical data.
Ha 3: There is a significant difference in second wait time between the FPC status Quo MedModel© and the empirical data.

Ho 4: There is not a significant difference in provider service time between the FPC status Quo MedModel© and the empirical data.
Ha 4: There is a significant difference in provider service time between the FPC status Quo MedModel© and the empirical data.

MODEL CAPACITY & PERFORMANCE

Ho A: There is not a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ha A: There is a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho A1: There is not a significant difference in number of patient visits between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©..
Ha A1: There is a significant difference in number of patient visits between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho A2: There is not a significant difference in first wait time between(100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.
Ha A2: There is a significant difference in first wait time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho A3: There is not a significant difference in screening service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.
Ha A3: There is a significant difference in screening service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho A4: There is not a significant difference in second wait time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.
Ha A4: There is a significant difference in second wait time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho A5: There is not a significant difference in provider service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.
Ha A5: There is a significant difference in provider service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho A6: There is no significant difference in provider utilization rates between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.
Ha A6: There is a significant difference in provider utilization rates between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho A7: There is no significant difference in patient total time in system between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.
Ha A7: There is a significant difference in patient total time in system between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Physician MedModel©.

Ho B: There is not a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ha B: There is a significant difference (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ho B1: There is not a significant difference in number of patient visits between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©..
Ha B1: There is a significant difference in number of patient visits between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ho B2: There is not a significant difference in first wait time between(100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.
Ha B2: There is a significant difference in first wait time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ho B3: There is not a significant difference in screening service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.
Ha B3: There is a significant difference in screening service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ho B4: There is not a significant difference in second wait time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.
Ha B4: There is a significant difference in second wait time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ho B5: There is not a significant difference in provider service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.
Ha B5: There is a significant difference in provider service time between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ho B6: There is no significant difference in provider utilization rates between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.
Ha B6: There is a significant difference in provider utilization rates between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

Ho B7: There is no significant difference in patient total time in system between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.
Ha B7: There is a significant difference in patient total time in system between (100% beneficiary enrollment goal) between the FPC Status Quo MedModel© and the FPC Combination MedModel©.

MODEL COMPARISON

Ho C: There is no significant difference (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ha C: There is a significant difference (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ho C1: There is not a significant difference in number of patient visits between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.
Ha C1: There is a significant difference in number of patient visits between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ho C2: There is not a significant difference in first wait time between(100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.
Ha C2: There is a significant difference in first wait time between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ho C3: There is not a significant difference in screening service time between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.
Ha C3: There is a significant difference in screening service time between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ho C4: There is not a significant difference in second wait time between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.
Ha C4: There is a significant difference in second wait time between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ho C5: There is not a significant difference in provider service time between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.
Ha C5: There is a significant difference in provider service time between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ho C6: There is not a significant difference in provider utilization rates between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.
Ha C6: There is a significant difference in provider utilization rates between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

Ho C7: There is not a significant difference in patient total time in system between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.
Ha C7: There is a significant difference in patient total time in system between (100% beneficiary enrollment goal) between the FPC Physician MedModel© and Combination MedModel©.

APPENDIX 3

DATE	ACTION	HMEDDAC POC
15 September 1995	Submit GMP Proposal to Preceptor	LTC Stanley Schmid
19 September 1995	Initial FPC Patient Flow Survey	FPC Staff
	Initial Empirical Data Observations	
20 September 1995	Discuss Project with Chief, Primary Care	Dr. Menich
	Empirical Data Observations	FPC Staff
	Process Study	
25 September 1995	Empirical Data Observations	FPC Staff
	Process Study & Pilot Patient Flow "Timings"	
26 September 1995	Empirical Data Observations	FPC Staff
	Patient Flow "Timings"	
	Discuss Project with C, Family Practice	MAJ Maliner
27 September 1995	Empirical Data Observations	FPC Staff
	Patient Flow "Timings"	
28 September 1995	Empirical Data Observations	FPC Staff
	Patient Flow "Timings"	
29 September 1995	Empirical Data Observations	FPC Staff
	Patient Flow "Timings"	
2 October 1995	Empirical Data Observations	FPC Staff
	Patient Flow "Timings"	
3 October 1995	Empirical Data Observations	FPC Staff
	Patient Flow "Timings"	
	Project Brief to FPC Staff	MAJ Maliner

DATE	ACTION	HMEDDAC POC
4 October 1995	Empirical Data Enrolled Beneficiary Data	FPC Staff
5 October 1995	Empirical Data Enrolled Beneficiary Data	FPC Staff
6 October 1995	Questionnaires sent to Key Staff Due 20 October 1995	Executive Committee C, CSD, C, Primary Care, FPC Staff
23 October 1995	Begin Status Quo Model Building	Author
24 October 1995	Begin Resolving Automation Compatability Problems--Model Building Postponed.	Author
30 October 1995	GMPP Mailed to MAJ Perry	Author
31 October 1995	Automation Compatability Resolved 32 bit access acquired for MedModel	Author
6 November 1995	Status Quo Model Built; FPC staff acknowledges model as "credible" and Pair-Wise t tests run between response variables and input variables	FPC Staff, Author
8 November 1995	Begin Building Alternative #1, Physician MedModel	Author
15 November 1995	Alternative #1 Built; Screening Process is Major Factor in Provider Utilization; Begin varying Alternative #1 Model	Author
19 November 1995	Three variations of Alternative #1 Built; Varied Screening Process	Author

DATE	ACTION	HMEDDAC POC
20 November 1995	Build Model Alternative #2	Author
1 December 1995	GMPP w/ minor modifications sent from FT Sam Houston.	MAJ Perry
15 December 1995	Received GMPP w/ minor modifications	Author
18 December 1995	Begin Correcting GMP	Author
21 December 1995	Corrections Made to GMP	Author
28 December 1995	Run NonTerminating Simulations	Author
9 January 1996	NonTerminating Simulations Complete	Author
13 January 1996	Terminating Simulations Complete	Author
14 January 1996	Conduct Pair-Wise t Test of Means	Author
15 January 1996	Write Results and Conclusions	Author
5 February 1996	Present Results to Preceptor	LTC Schmid & Author
15 February 1996	Present Final GMP to Preceptor	LTC Schmid & Author
29 February 1996	Minor Corrections Discussed w/ Preceptor	LTC Schmid & Author
3 March 1996	Mail GMP to FT Sam Houston ATTN: MAJ Mark Perry	Author

FAMILY PRACTICE CLINIC SIMULATION EMPIRICAL OBSERVATIONS
DATE_____

Start Time_____

Time In	Screen Time In	Screen Out	Provider Time In	Provider Out	Lab/Rad Resp Th/ Pharm	Patient Return to FPC	Return to Same Provider
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		
					L R RT Ph		

INTERARRIVAL TIME INTO CLINIC

1._____	6._____	11._____	16._____	21._____
2._____	7._____	12._____	17._____	22._____
3._____	8._____	13._____	18._____	23._____
4._____	9._____	14._____	19._____	24._____
5._____	10._____	15._____	20._____	25._____

HMEDDAC FAMILY PRACTICE ENROLLED POPULATION DATA SHEET

Date____________________

NATO #Families___________ **# of Active Duty**___________

Active Duty (Includes NATO Mbrs)	AD Family Members	Family Size (All)	Family Size (All)	Retirees	DACs
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	X X X X X X X X X X
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	X X X X X X X X X X
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	X X X X X X X X X X
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	**DAC Family Mbr**
X X X X X X X X X X	X X X X X X X X X X			**Retiree Family Mbrs**	X X X X X X X X X X
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	X X X X X X X X X X
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	X X X X X X X X X X
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	X X X X X X X X X X
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	**DODDS & Family Mbr**
X X X X X X X X X X	X X X X X X X X X X			X X X X X X X X X X	X X X X X X X X X X

Total__________ Total__________ Total Families_______ Total Ret_______ TotalDAC_____

Total Members_______ Total RFM_____ TotalDACfm___

Total Ret Families____________ TotalDoDDs____

TOTAL PAGE ____________________

FAMILY PRACTICE CLINIC

ALL PATIENT'S MUST SIGN IN!
FILL IN ALL INFORMATION COMPLETELY & LEGIBLY

PATIENT'S NAME (LAST, FIRST)	FMP	COMPLETE SSN (SPONSOR'S)	AD	AD FM	RET	RET FM	DAC FM	GOODRICH	MALINER	VANDERM	TORRANCE	ZBYLSKI	CHU	DAVIS	TIME OF SIGN-IN USE CLINIC CLOCK!

AEMHA-DCA 10 October 1995

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Subject Matter Expert Interview Questionnaire

1. The Administrative Resident requests that you provide input to a consulting project that will offer several workable alternatives to staffing the Family Practice Clinic. The alternatives will be based on 100% Active Duty and Active Duty Family Member enrollment into the primary care program. Your input will steer the project toward the workable solutions.

2. Request that you complete the questionnaire by 20 October 1995. I will come by your area to pick up the completed document. If you desire a personal interview rather than an impersonal questionnaire, please call me at DSN 371-2822/2622.

3. Thank you for your time and efforts.

GERALD R. LEDLOW
CPT, MS
Administrative Resident

Encls

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C, Primary Care ATTN: MAJ MENICH
C, CSD ATTN: MAJ COOK
C, Family Practice ATTN: MAJ MALINER
FAMILY PRACTICE CLINIC PHYSICIANS (5)
MAJ CHAPMAN, HEAD NURSE PRIMARY CARE
SSG MCDUFFIE, FPC
SGT COFFEY-LEE, FPC
Ms. JOHNSON, FPC
Ms. STEWART, FPC
SPC McCLURE, FPC

AEMHA-DCA
10 October 1995
SUBJECT: Subject Matter Expert Interview Questionnaire

FAMILY PRACTICE CLINIC QUESTIONNAIRE
STAFFING CONFIGURATION CONSULTING PROJECT

TEAM CONCEPTS

1. What is your professional opinion of the Primary Care Team Concept. A team will be responsible for a portion of the enrolled population. An example is DR. A and DR. Z are the primary care managers for all health care for the following units: LANDCENT, HMEDDAC, HDENTAC, HQ USAREUR, etc....

2. Would the team concept, in your view, form a continuum of primary care services to include: PEDS, INT MED, OB/GYN, Etc...?

3. Should the team include other health care providers?

4. REMARKS and SUGGESTIONS.

PHYSICIAN EXTENDERS

5. Would you incorporate Nurse Practitioners and/or Physician's Assistants into the Family Practice Clinic?

6. In your view, at what level of autonomy would the NPs and/or PAs be allowed to practice?

7. How much supervisory time (specific to the NPs and/or PAs) would the Physicians need to manage the physician extenders?

8. REMARKS AND SUGGESTIONS.

GENERAL INFORMATION

14. How many beneficiaries can a Family Practice Provider have in a panel (enrolled under that provider)? INFO: OTSG Norm is 1250 beneficiaries to 1 provider with 4-5 visits per beneficiary per year.

15. Should eligible Retirees and their Families be offered enrollment into the Family Practice Program? INFO: There are 293 Retirees and Family members currently enrolled with another 843 not enrolled.

16. REMARKS AND SUGGESTIONS.

A's P code mtg

EXISTING

NEW

DEMOLITION

MANFRED A. MARX
Architect
Hlth Fac Plan Div

371-2716

HMEDDAC FAMILY PRACTICE CLINIC: Subject Matter Expert Summary

	DEMOGRAPHIC INFORMATION			TEAM CONCEPTS				PHYSICIAN EXTENDERS		
OBSERVATION	EXECUTIVE COMMITTEE	MEDICAL CORPS	NURSE CORPS	MEDICAL SERVICE	UNIT GROUPs by PROVIDER	PRIMARY CARE TEAMS	USE NON-PHYSICIAN PROVIDERS	NPs & PAs in FPC	FULL AUTONOMY	MODERATE AUTONOMY	LIMITED AUTONOMY
1	0	1	0	0	1	1	1	1	1	0	0
2	0	1	0	0	1	0	1	1	0	1	0
3	0	1	0	0	0	0	1	1	0	1	0
4	1	1	0	0	0	1	1	1	1	0	0
5	0	0	1	0	1	1	1	1	0	1	0
6	0	1	0	0	0	0	1	1	0	1	0
7	1	1	0	0	0	0	1	1	1	0	0
8	1	0	0	1	1	1	1	1	0	1	0
9	0	1	0	0	0	1	1	1	1	0	0
10	0	0	1	0	0	1	1	1	0	1	0
10	30.00%	70.00%	20.00%	10.00%	40.00%	60.00%	100.00%	100.00%	40.00%	60.00%	0.00%

	PHYSICIAN NP & PA SUPERVISION			FPC FACILITY CONSTRAINTS				GENERAL INFORMATION		
OBSERVATION	MUCH SUPERVISION	MODERATE SUPERVISION	MINIMAL SUPERVISION	3 EXAM ROOMS per PROVIDER	2 EXAM ROOMS per PROVIDER	1 EXAM ROOM per PROVIDER	SEPARATE OFFICES	NEW FPC NUMBER of PROVIDERS	PHYSICIAN PANEL SIZE	INCLUDE RETIREES in FPC PROGRAM
1	0	0	1	0	1	0	1	5	1250	0
2	0	0	1	0	1	0	1	6	1400	1
3	0	1	0	0	1	0	1	6	1250	1
4	0	0	1	1	0	0	1	5	1250	0
5	0	1	0	0	1	0	0			
6	0	1	0	0	1	0	1	7	1350	1
7	0	0	1	0	1	0	1	7	1250	1
8									1250	0
9	0	0	1	0	1	0	1	6	1500	0
10	0	1	0	0	1	0	1	5	1400	0
10	0.00%	44.44%	55.56%	11.11%	88.89%	0.00%	88.89%	5.22	1322	44.44%

*NOTE: HMEDDAC Subject Matter Expert Questionnaire Results; 5 Nov 1995

QUESTIONNAIRES

SENT OUT	RECEIVED
16	10

RETURN %	62.50%

SUMMARY of RESULTS:

The subject matter experts (SME) believe that physician extenders can provide patient care with minimal to moderate supervision while permitting moderate to full autonomy. Also the SMEs feel that physician extenders could be included in the Family Practice Clinic. The provider to beneficiary ratio should be 1 provider to 1300 - 1350 beneficiaries. Each provider should have their own office and work from two exam rooms. Less than half of the SMEs feel that the FPC should include retirees into the Primary Care Management Program.

APPENDIX 4-5

HMEDDAC FPC: Descriptive Statistics of Input Variables

INTERARRIVAL RATE	Measurement Unit Minutes
Mean	**7.1509**
Standard Error	0.4004
Median	5.0000
Mode	0.0000
Standard Deviation	**8.4374**
Variance	**71.1894**
Kurtosis	5.7451
Skewness	2.1295
Range	**53.0000**
Minimum	**0.0000**
Maximum	**53.0000**
Sum	3175.0000
Count	444.0000
Confidence Level (0.950)	0.7848

1st WAITING TIME TOTAL MINUTES	Measurement Unit Minutes
Mean	**6.5706**
Standard Error	0.5450
Median	5.1000
Mode	2.0833
Standard Deviation	**5.4770**
Variance	**29.9970**
Kurtosis	6.9177
Skewness	2.3899
Range	**30.3667**
Minimum	**0.8333**
Maximum	**31.2000**
Sum	663.6333
Count	101.0000
Confidence Level (0.950)	1.0681

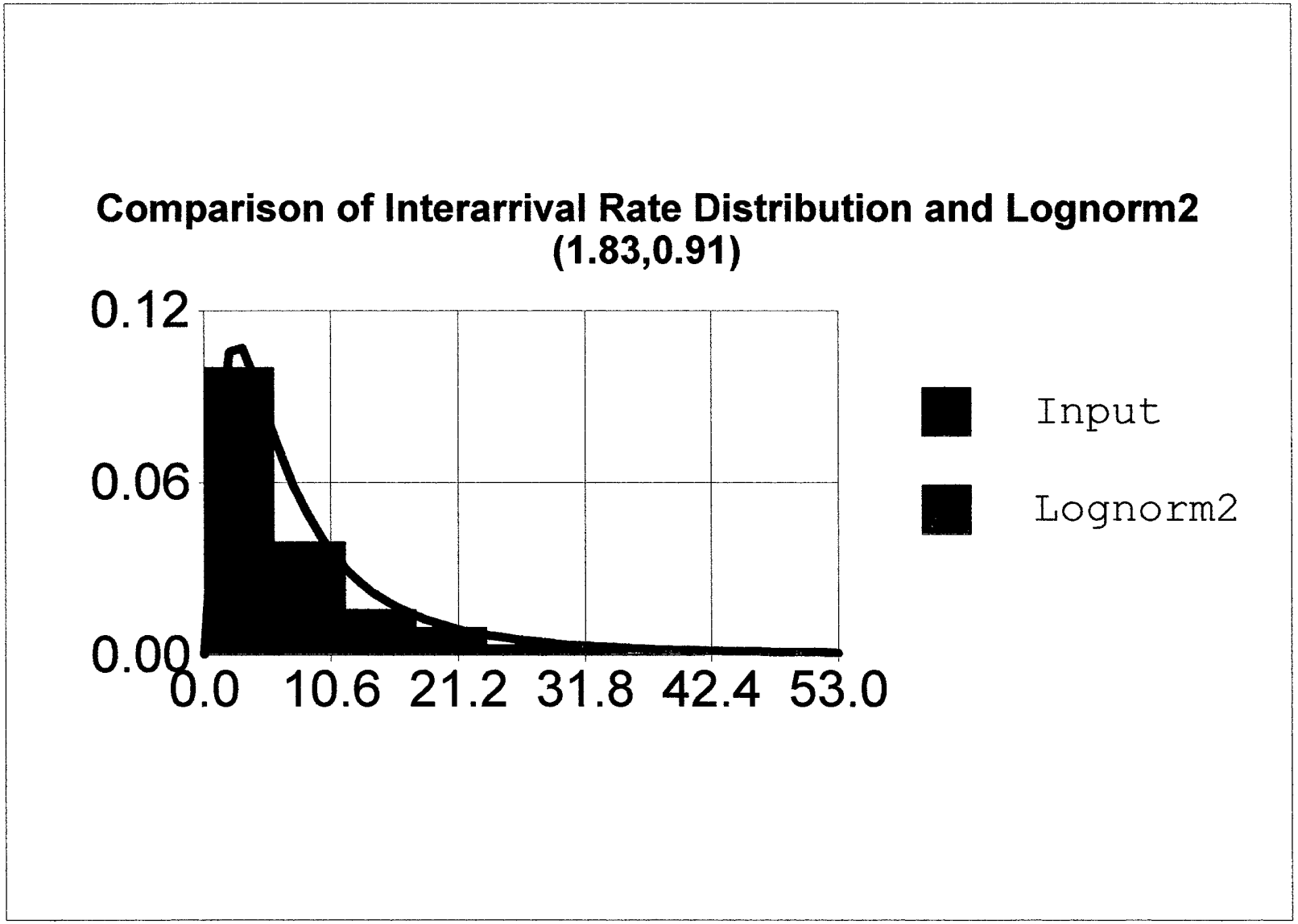
SCREEN SERVICE TOTAL MINUTES	Measurement Unit Minutes
Mean	**4.4583**
Standard Error	0.1907
Median	3.9833
Mode	2.1667
Standard Deviation	**1.9164**
Variance	**3.6724**
Kurtosis	2.6523
Skewness	1.4299
Range	**9.7833**
Minimum	**1.4167**
Maximum	**11.2000**
Sum	450.2833
Count	101.0000
Confidence Level (0.950)	0.3737

2d WAITING TIME TOTAL MINUTES	Measurement Unit Minutes
Mean	**14.4411**
Standard Error	1.2537
Median	11.9000
Mode	0.3333
Standard Deviation	**12.5997**
Variance	**158.7520**
Kurtosis	1.8041
Skewness	1.3578
Range	**57.4500**
Minimum	**0.3333**
Maximum	**57.7833**
Sum	1458.5500
Count	101.0000
Confidence Level (0.950)	2.4572

PROVIDER SERVICE TOTAL MINUTES	Measurement Unit Minutes
Mean	**16.1366**
Standard Error	0.8762
Median	14.5500
Mode	7.1000
Standard Deviation	**8.8053**
Variance	**77.5329**
Kurtosis	2.0928
Skewness	1.4033
Range	**41.8000**
Minimum	**3.6167**
Maximum	**45.4167**
Sum	1629.8000
Count	101.0000
Confidence Level (0.950)	1.7172

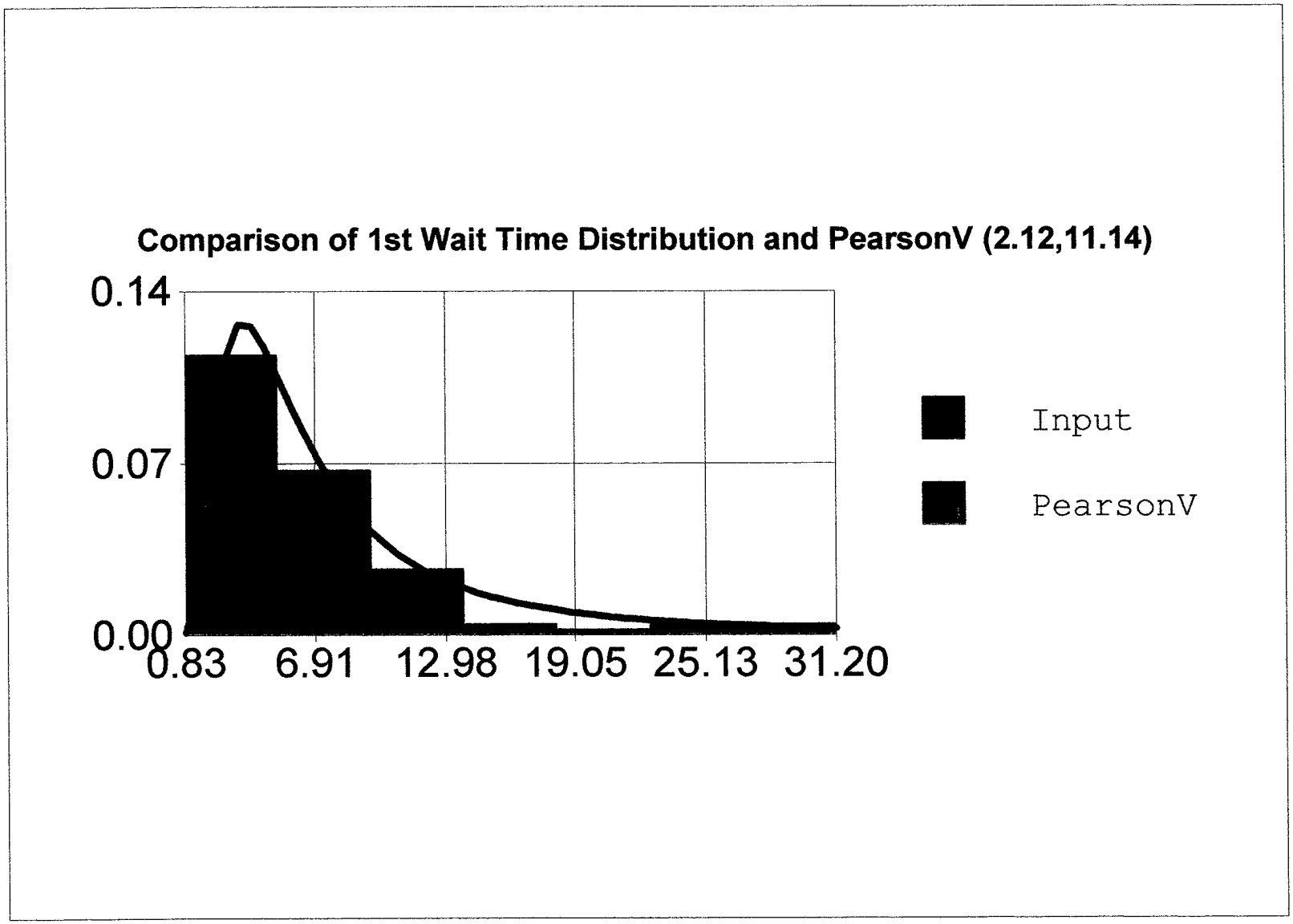
TOTAL TIME MINUTES	Measurement Unit Minutes
Mean	**41.6066**
Standard Error	1.6639
Median	39.8167
Mode	NA
Standard Deviation	**16.7220**
Variance	**279.6248**
Kurtosis	0.7855
Skewness	0.8870
Range	**81.5333**
Minimum	**11.7000**
Maximum	**93.2333**
Sum	4202.2667
Count	101.0000
Confidence Level (0.950)	3.2612

APPENDIX 5


Comparison of Interarrival Rate Distribution and Lognorm2
(1.83,0.91)
0.12
0.06
0.00
0.0
10.6
21.2
31.8
42.4
53.0
Input
Lognorm2

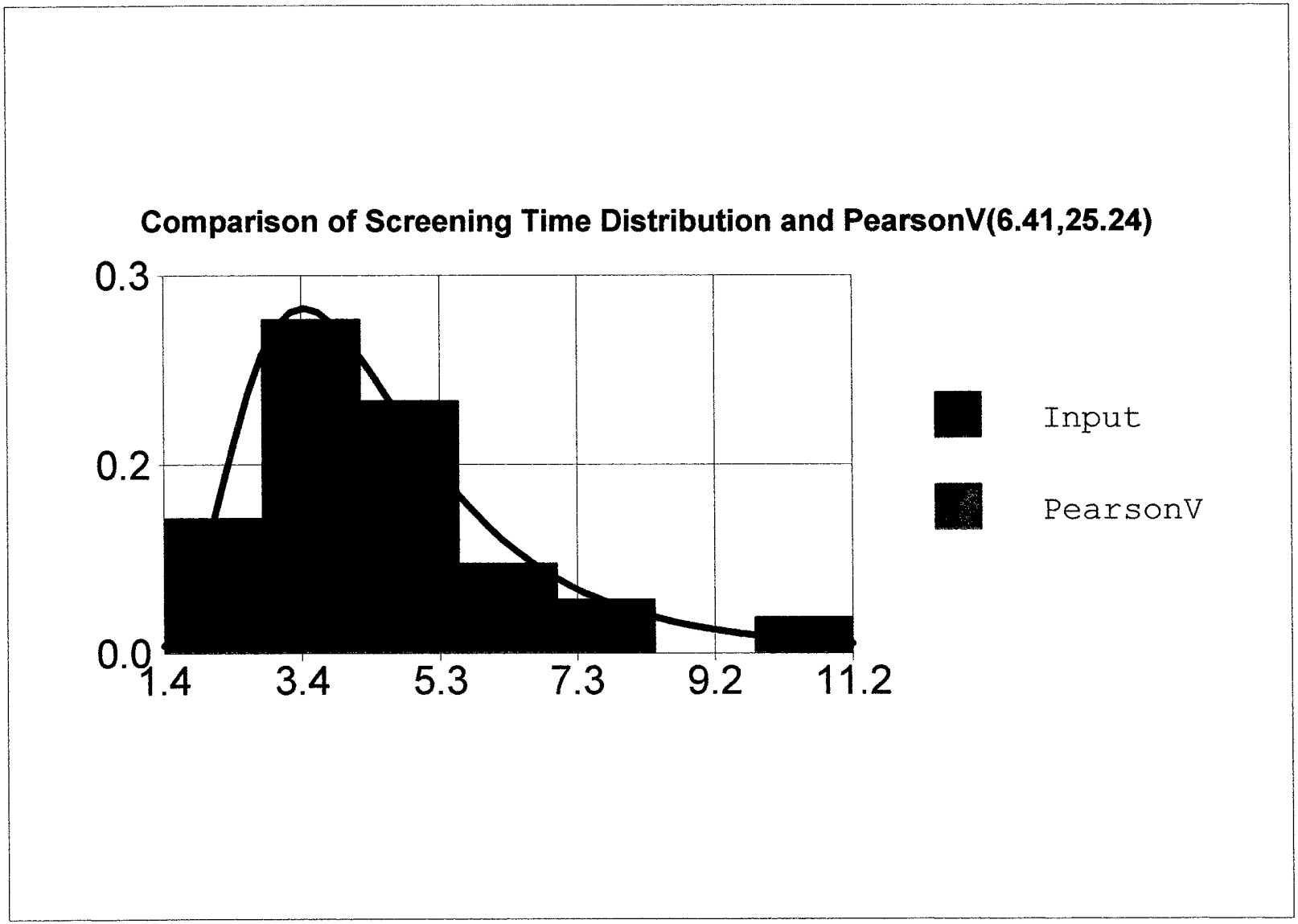
	Input Data	Lognorm2(1.83,0.91)	Lognorm(9.49,10.83)	Expon(7.16)
Minimum=	0.0			
Maximum=	53.0			
Mode=	2.944444	2.717593	2.717593	0.0
Mean=	7.164786	9.493155	9.493155	7.164786
Std Deviation=	8.441839	10.833188	10.833188	7.164786
Variance=	71.264639	117.35796	117.35796	51.334152
Skewness=	2.112534	4.909536	4.909536	2.0
Kurtosis=	8.614792	65.399469	65.399469	9.0
Input Settings:				
Type of Fit:	Full Optimization			
Tests Run:	Chi-Square		K-S Test	
Histogram:				
Min:	0.0	0.0	0.0	0.0
Max:	53.0	53.0	53.0	53.0
P1:	0.097747	0.105542	0.105542	0.092538
P2:	0.038332	0.046053	0.046053	0.040678
P3:	0.015333	0.019129	0.019129	0.017882
P4:	9.19971e-3	9.039231e-3	9.039231e-3	7.860522e-3
P5:	3.449891e-3	4.72603e-3	4.72603e-3	3.455378e-3
P6:	3.449891e-3	2.666837e-3	2.666837e-3	1.518937e-3
P7:	3.833213e-4	1.596353e-3	1.596353e-3	6.677039e-4
P8:	1.533285e-3	1.00152e-3	1.00152e-3	2.935135e-4
P9:	3.833213e-4	6.528699e-4	6.528699e-4	1.290245e-4
# Classes=	9.0			
Best Fit Results				
C-S Test		11.781737	11.781737	24.349658
C-S Rank		1.0	2.0	3.0
K-S Test		0.264359	0.264359	0.218962
K-S Rank		4.0	5.0	2.0

	InverseGaussian(8.28,9.35)	PearsonV(1.30,5.29)	ExtremeValue(3.37,6.58)	PearsonVI(0.65,0.48,1.86)
Minimum=				
Maximum=				
Mode=	2.768144	2.297609	3.365546	0.0
Mean=	8.275208	17.570387	7.164786	835.44856
Std Deviation=	7.784756	30.713178	8.441839	6980.619556
Variance=	60.602428	943.29929	71.264639	4.872905e+7
Skewness=	2.822197	6.583026	1.139547	9.688625
Kurtosis=	16.274662	52.938442	5.4	95.803862
Input Settings:				
Type of Fit:				
Tests Run:	A-D Test			
Histogram:				
Min:	0.0	0.0	0.0	0.0
Max:	53.0	53.0	53.0	53.0
P1:	0.124929	0.134567	0.055774	0.057599
P2:	0.046355	0.035561	0.042818	0.015915
P3:	0.01781	0.013947	0.022644	8.115244e-3
P4:	7.875211e-3	7.125602e-3	0.010283	5.120452e-3
P5:	3.800359e-3	4.231042e-3	4.388047e-3	3.606618e-3
P6:	1.942753e-3	2.76489e-3	1.825386e-3	2.717535e-3
P7:	1.034245e-3	1.930426e-3	7.514853e-4	2.143179e-3
P8:	5.673635e-4	1.414672e-3	3.080632e-4	1.746792e-3
P9:	3.185081e-4	1.075725e-3	1.260679e-4	1.459605e-3
# Classes=				
Best Fit Results				
C-S Test	29.059046	34.022273	108.930924	187.049526
C-S Rank	4.0	5.0	6.0	7.0
K-S Test	0.273663	0.276902	0.18872	0.218962
K-S Rank	6.0	7.0	1.0	3.0


Comparison of 1st Wait Time Distribution and PearsonV (2.12,11.14)
0.14
0.07
0.00
0.83
6.91
12.98
19.05
25.13
31.20
Input
PearsonV

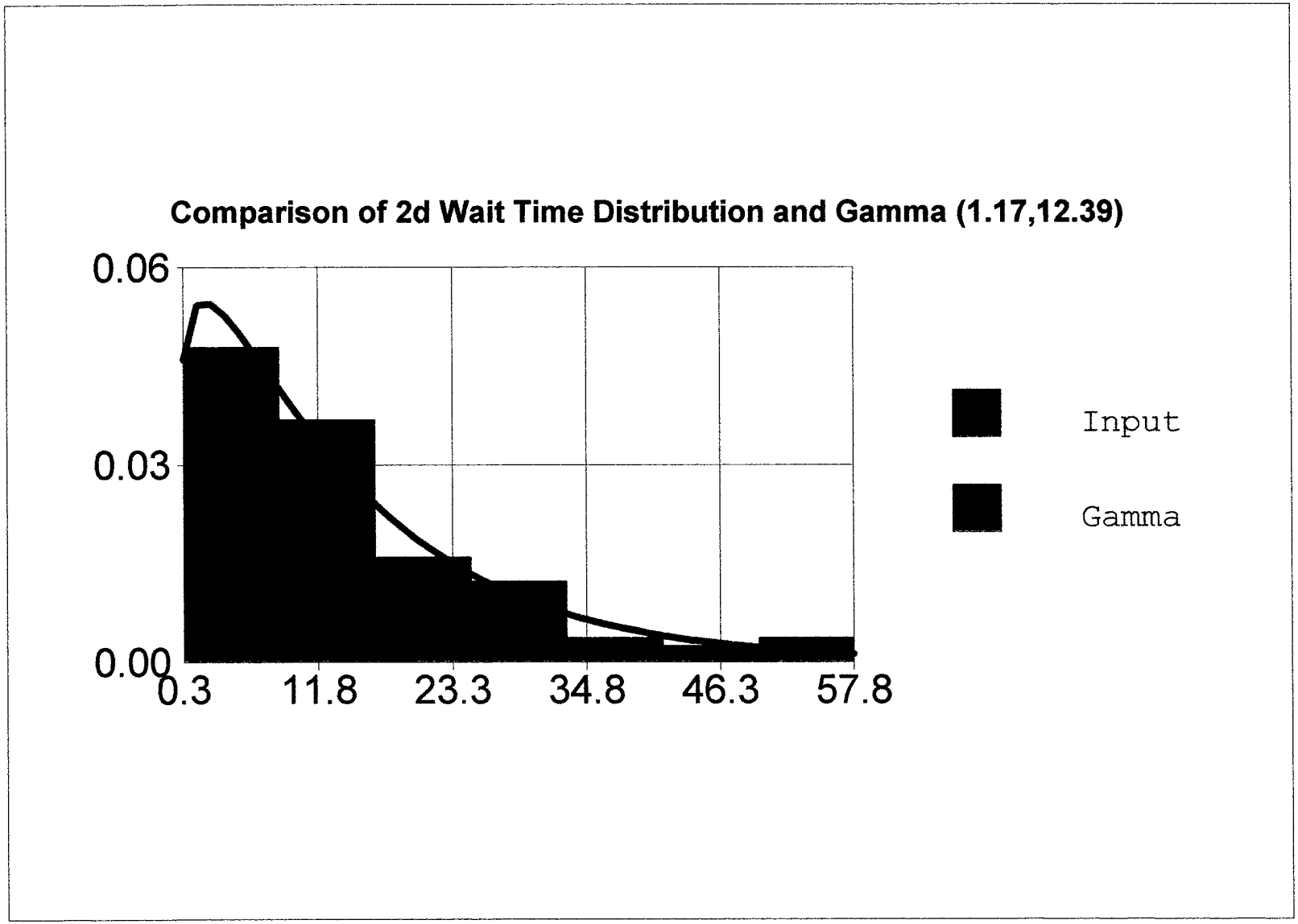
	Input Data	PearsonV(2.12,11.14)	InverseGaussian(7.76,10.20)	Lognorm2(1.73,0.74)
Minimum=	0.8333			
Maximum=	31.2			
Mode=	3.00235	3.565928	2.91915	3.272846
Mean=	6.583997	9.915008	7.759223	7.391404
Std Deviation=	5.50289	28.23775	6.76704	6.277664
Variance=	30.281794	797.370511	45.792835	39.409069
Skewness=	2.302556	4.276885	2.616386	3.16061
Kurtosis=	9.227973	26.726189	14.409125	24.869353
Input Settings:				
Type of Fit:	Full Optimization			
Tests Run:	Chi-Square		K-S Test	
Histogram:				
Min:	0.8333	0.8333	0.8333	0.8333
Max:	31.2	31.2	31.2	31.2
P1:	0.117563	0.124629	0.129343	0.125208
P2:	0.069155	0.068402	0.06394	0.069142
P3:	0.027662	0.028182	0.02856	0.028419
P4:	4.610313e-3	0.013605	0.013859	0.012371
P5:	2.305157e-3	7.463465e-3	7.169099e-3	5.821888e-3
P6:	4.610313e-3	4.493938e-3	3.882491e-3	2.936174e-3
P7:	4.610313e-3	2.899759e-3	2.175031e-3	1.569511e-3
# Classes=	7.0			
Best Fit Results				
C-S Test		4.746841	6.013387	6.214463
C-S Rank		1.0	2.0	3.0
K-S Test		0.162483	0.142885	0.105212
K-S Rank		6.0	5.0	4.0
A-D Test		6.770111	2.872048	1.429289
A-D Rank		6.0	5.0	3.0

	PearsonVI(5.60,3.68,3.17)	Lognorm(6.52,5.26)	Weibull(1.36,7.26)
Minimum=			
Maximum=			
Mode=	3.116418	3.077696	2.758122
Mean=	6.622237	6.521965	6.64077
Std Deviation=	6.208662	5.257427	4.922436
Variance=	38.547481	27.640534	24.23038
Skewness=	2.677182	2.942155	1.14421
Kurtosis=	12.988769	21.555563	4.291766
Input Settings:			
Type of Fit:			
Tests Run:	A-D Test		
Histogram:			
Min:	0.8333	0.8333	0.8333
Max:	31.2	31.2	31.2
P1:	0.149058	0.142537	0.101005
P2:	0.065179	0.067066	0.06838
P3:	0.022338	0.024147	0.032975
P4:	8.849657e-3	9.422878e-3	0.013187
P5:	4.01878e-3	4.039485e-3	4.60273e-3
P6:	2.03162e-3	1.877326e-3	1.439708e-3
P7:	1.116536e-3	9.328924e-4	4.102073e-4
# Classes=			
Best Fit Results			
C-S Test	10.903001	11.55231	26.154957
C-S Rank	4.0	5.0	6.0
K-S Test	0.052266	0.054404	0.091585
K-S Rank	1.0	2.0	3.0
A-D Test	0.238326	0.256776	1.788961
A-D Rank	1.0	2.0	4.0

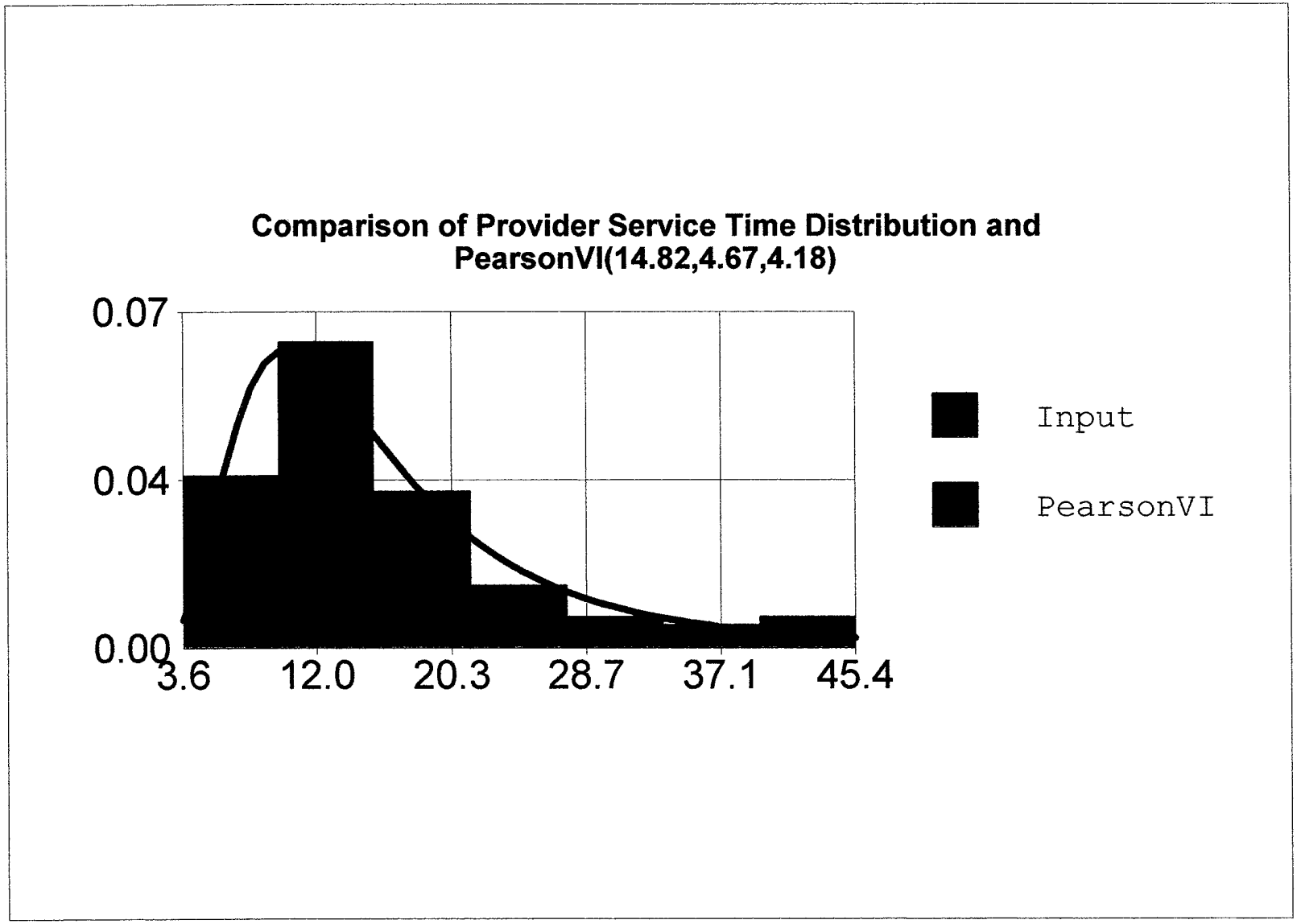

Comparison of Screening Time Distribution and PearsonV(6.41,25.24)
0.3
0.2
0.0
1.4
3.4
5.3
7.3
9.2
11.2
Input
PearsonV

	Input Data	PearsonV(6.41,25.24)	PearsonVI(40.11,7.35,0.71)	InverseGaussian(4.47,25.37)
Minimum=	1.4167			
Maximum=	11.2			
Mode=	3.513121	3.404807	3.34433	3.440091
Mean=	4.466333	4.662829	4.509713	4.466333
Std Deviation=	1.924273	2.219652	2.097984	1.873894
Variance=	3.702825	4.926854	4.401535	3.511477
Skewness=	1.372628	1.736569	1.58692	1.258679
Kurtosis=	5.297879	7.320322	6.599337	5.640456
Input Settings:				
Type of Fit:	Full Optimization			
Tests Run:	Chi-Square		K-S Test	
Histogram:				
Min:	1.4167	1.4167	1.4167	1.4167
Max:	11.2	11.2	11.2	11.2
P1:	0.107326	0.101396	0.123222	0.124011
P2:	0.264737	0.271918	0.270404	0.258892
P3:	0.200341	0.175471	0.170963	0.179997
P4:	0.07155	0.085592	0.081769	0.090087
P5:	0.04293	0.040115	0.037191	0.039508
P6:	0.0	0.01928	0.01722	0.016288
P7:	0.02862	9.672952e-3	8.289305e-3	6.50659e-3
# Classes=	7.0			
Best Fit Results				
C-S Test		8.79884	10.686927	14.008453
C-S Rank		1.0	2.0	3.0
K-S Test		0.061339	0.06532	0.364518
K-S Rank		3.0	4.0	5.0
A-D Test		0.616073	0.384723	5.386504
A-D Rank		4.0	3.0	5.0

	Lognorm2(1.41,0.40)	Lognorm(4.46,1.87)
Minimum=		
Maximum=		
Mode=	3.499598	3.499598
Mean=	4.461198	4.461198
Std Deviation=	1.869871	1.869871
Variance=	3.496419	3.496419
Skewness=	1.331058	1.331058
Kurtosis=	6.3073	6.3073
Input Settings:		
Type of Fit:		
Tests Run:	A-D Test	
Histogram:		
Min:	1.4167	1.4167
Max:	11.2	11.2
P1:	0.11947	0.11947
P2:	0.261322	0.261322
P3:	0.183321	0.183321
P4:	0.089408	0.089408
P5:	0.038127	0.038127
P6:	0.015521	0.015521
P7:	6.268618e-3	6.268618e-3
# Classes=		
Best Fit Results		
C-S Test	14.290629	14.290629
C-S Rank	4.0	5.0
K-S Test	0.050772	0.050772
K-S Rank	1.0	2.0
A-D Test	0.322634	0.322634
A-D Rank	1.0	2.0


Comparison of 2d Wait Time Distribution and Gamma (1.17,12.39)
0.06
0.03
0.00
0.3
11.8
23.3
34.8
46.3
57.8
Input
Gamma

	Input Data	Gamma(1.17,12.39)	Weibull(1.12,15.12)	Expon(14.52)	ExtremeValue(8.84,9.85)
Minimum=	0.3333				
Maximum=	57.7833				
Mode=	4.436871	2.134369	2.046331	0.0	8.836994
Mean=	14.523658	14.523658	14.512392	14.523658	14.523658
Std Deviation=	12.635661	13.414089	12.987872	14.523658	12.635661
Variance=	159.65994	179.937797	168.684826	210.936642	159.65994
Skewness=	1.302934	1.847205	1.514982	2.0	1.139547
Kurtosis=	4.522606	8.118251	5.604388	9.0	5.4
Input Settings:					
Type of Fit:	Full Optimization				
Tests Run:	Chi-Square		K-S Test		A-D Test
Histogram:					
Min:	0.3333	0.3333	0.3333	0.3333	0.3333
Max:	57.7833	57.7833	57.7833	57.7833	57.7833
P1:	0.04752	0.051048	0.049621	0.050728	0.033238
P2:	0.036554	0.031524	0.031959	0.028829	0.034959
P3:	0.01584	0.017716	0.018356	0.016384	0.022314
P4:	0.012185	9.671793e-3	0.010025	9.31122e-3	0.011463
P5:	3.655352e-3	5.205058e-3	5.301372e-3	5.291661e-3	5.358602e-3
P6:	2.436902e-3	2.777309e-3	2.737365e-3	3.007305e-3	2.404193e-3
P7:	3.655352e-3	1.473483e-3	1.386934e-3	1.709082e-3	1.059596e-3
# Classes=	7.0				
Best Fit Results					
C-S Test		4.622161	4.771449	4.930623	12.33892
C-S Rank		1.0	2.0	3.0	4.0
K-S Test		0.073669	0.06514	0.095126	0.093424
K-S Rank		2.0	1.0	4.0	3.0
A-D Test		0.415617	0.37167	0.644519	1.023123
A-D Rank		2.0	1.0	3.0	4.0


Comparison of Provider Service Time Distribution and PearsonVI(14.82,4.67,4.18)
0.07
0.04
0.00
3.6
12.0
20.3
28.7
37.1
45.4
Input
PearsonVI

	Input Data	PearsonVI(14.82,4.67,4.18)	PearsonV(3.69,45.45)	Lognorm2(2.65,0.52)
Minimum=	3.6167			
Maximum=	45.4167			
Mode=	12.573843	10.183906	9.689799	10.775084
Mean=	16.227001	16.872337	16.893641	16.281721
Std Deviation=	8.802441	11.53373	12.994436	9.164162
Variance=	77.482966	133.026932	168.855356	83.981857
Skewness=	1.357144	2.196231	2.629018	1.86686
Kurtosis=	4.821841	9.853308	12.69806	9.775069
Input Settings:				
Type of Fit:	Full Optimization			
Tests Run:	Chi-Square		K-S Test	
Histogram:				
Min:	3.6167	3.6167	3.6167	3.6167
Max:	45.4167	45.4167	45.4167	45.4167
P1:	0.036842	0.042717	0.046483	0.039775
P2:	0.065311	0.058358	0.059544	0.058897
P3:	0.033493	0.032948	0.030813	0.035998
P4:	0.013397	0.016531	0.015114	0.018014
P5:	6.698565e-3	8.441664e-3	7.816974e-3	8.616098e-3
P6:	5.023923e-3	4.515872e-3	4.312527e-3	4.135066e-3
P7:	6.698565e-3	2.538768e-3	2.523291e-3	2.025646e-3
# Classes=	7.0			
Best Fit Results				
C-S Test		5.656442	6.074227	8.162822
C-S Rank		1.0	2.0	3.0
K-S Test		0.105435	0.125979	0.090494
K-S Rank		5.0	6.0	1.0
A-D Test		0.993484	1.434479	0.75425
A-D Rank		5.0	6.0	1.0

	Lognorm(16.28,9.16)	ExtremeValue(12.27,6.86)	Gamma(3.88,4.18)
Minimum=			
Maximum=			
Mode=	10.775084	12.265473	12.048677
Mean=	16.281721	16.227001	16.227001
Std Deviation=	9.164162	8.802441	8.234177
Variance=	83.981857	77.482966	67.801668
Skewness=	1.86686	1.139547	1.014874
Kurtosis=	9.775069	5.4	4.544952
Input Settings:			
Type of Fit:			
Tests Run:	A-D Test		
Histogram:			
Min:	3.6167	3.6167	3.6167
Max:	45.4167	45.4167	45.4167
P1:	0.039775	0.033938	0.035499
P2:	0.058897	0.053548	0.054486
P3:	0.035998	0.039098	0.040019
P4:	0.018014	0.020671	0.021437
P5:	8.616098e-3	9.546492e-3	9.627018e-3
P6:	4.135066e-3	4.166005e-3	3.862098e-3
P7:	2.025646e-3	1.775369e-3	1.432526e-3
# Classes=			
Best Fit Results			
C-S Test	8.162822	12.464866	16.051247
C-S Rank	4.0	5.0	6.0
K-S Test	0.090494	0.098171	0.100486
K-S Rank	2.0	3.0	4.0
A-D Test	0.75425	0.96979	0.940789
A-D Rank	2.0	4.0	3.0

APPENDIX 7

PROJECT DATA SUMMARY

Reference #	Information	Quantity	Unit of Measure	Source of Data	Project Reference
1	Eligible Beneficiaries (Heidelberg)	16140	Persons	ASIP, 11 Sept 1995	Appendix 1
1a	Military Personnel (Active Duty)	3592			
1b	Military (Active Duty) Family Members	5869			
1c	NATO & Family Members	538			
1d	Retirees & Family Members	1136			
1	DACs & Family Members	5005			
2	Family Practice Program Enrolled Population	4754	Persons	FPC Manual Files, Researcher Compiled 5 Oct 1995	Appendix 1

3	FPC Total Patient Visits	22339	Visit	AQCESS Extract Sept 1994 - Aug 1995	Appendix 1
4	Physician Extender Utilization for Primary Care		% of Patients Physician Extenders can treat/manage		Literature Review
4a		60-80%		Doblin, *JAMA*, 5 Feb 1992, pg. 698.	
4b		72%		Frampton, *HMO Practice*, Dec 1994, pg. 165.	
5	Provider to Beneficiary Staffing Ratio		Provider per 1000 Beneficiaries		Literature Review
5a		.8 (1:1250)		Powers, OTSG Planning Figure, 15 Aug 1995	
5b		1:1300		Subject Matter Expert (HMEDDAC) Survey Results	
5c		.8 (1:1250)		Kongstvedt, *Essentials of Managed Health Care*, 1995, pg. 50.	

6	FPC Enrollee Clinic Utilization	4.699	Enrollee Visits/Year	#2 and #3 above	Appendix 1
6a	Total Enrollment Goal Patient Visits Required (Capacity)	****48,372 visits required for goal**	Total Enrollment Goal Annual Visits (Capacity of FPC) Required	11386 enrolled @ 4.699 visits/year = 48,372	
7	FPC Provider Patient Encounter Time in CLinic	0.7008	% time in Clinic for Patient Visits	AQCESS Extract, Sept 1994 - Aug 1995	Appendix 1
8	Physician Extender FTE vs. Physicians	0.8	Physician Extender FTE	Kongstvedt, *Essentials of Managed Health Care*, 1995, pg. 50.	Literature Review
9	FPC Activity Times & Distributions	Interarrival Rates (n=479) Time & Condition Dependent Variables (n=101)	Observations	Researcher Observations, Sept 1995 - Oct 1995	Appendix 5 & 6
9a	Descriptive Statistics			QuatroPro© Spreadsheet	Appendix 5
9b	Theoretical Distributions			BestFit© Analysis	Appendix 6

10	Physician Extender Cost GS-11, Step 5 CONUS Hire	$64,001	Composite Annual Cost CONUS Hire	USAREUR Circular 37-11, Change 1 & USAREUR Civilian Personnel Office Memorandum	Appendix 7
10a	Physician Cost GS-13, Step 5 CONUS Hire	$97,211	Composite Annual Cost CONUS Hire	USAREUR Circular 37-11, Change 1	Appendix 7
11	FPC Patient Ancillary Utilization		% Patients	Patient Flow Observations, Researcher Compiled	
11a	Laboratory	9.9%			
11b	Radiology	7.92%			
11c	Respiratory Therapy	0%			
11d	Pharmacy	71.29%			
12	Patient Return to FPC after Ancillaries	4.95%	% Patients	Patient Flow Observations, Researcher Compiled	

Medical Expense and Performance Reporting System (MEPRS)

Definition: MEPRS is an accounting system that accumulates and reports expenses, manpower, and workload performed by Department of Defense fixed medical facilities.

Purpose: To provide consistent and uniform reporting of expense, manpower, and workload by fixed DOD medical and dental treatment facilities.

MEPRS Replacement Costs: is based on previous civilian equivalent costs for military manpower and increases, due to inflation, annually. MEPRS replacement costs are developed by the Program & Budget Branch, U.S. Army Medical Command. MEPRS replacement costs and USAREUR civilian costs (CONUS Hire) for GS-13 Step 5 (Family Practice Physician) and GS-11 Step 5 (Physician Extenders) are within $500 of each other.

Concerns: MEPRS, historically, has had difficulty in determining accurate cost drivers for cost allocation. This problem impacts the actual cost that is determined during the step-down procedure. According to the HMEDDAC Comptroller, LTC McMaughn, MEPRS costs can be skewed (less cost than actual) by up to 20%. With this in mind and until a better system is adopted, MEPRS is still the best system to determine cost with regard to the cost of determining actual and accurate costs.

APPENDIX 8

Status Quo MedModel validation was accomplished by conducting Pair-Wise t tests between the simulated response variables and the input empirical data. Two pieces of the FPC process do not contain distributions within the simulation program (the First and Second Wait Time). To validate that the wait times were modeled correctly, "Goodness-of-Fit" comparisons were conducted.

Table 12. Status Quo Model Validation Summary.

FPC Activity	**Pair-Wise t Test Value (df=100)**	**Probability (∝=.05)**	**Theoretical Distribution**	**Distribution Test χ^2 (Wait Times)**
First Wait Time	3.78	.0026	Pearson V	BestFit=Normal Critical Value=11.071 **$\chi^2 = 10.805$**
Screening Time	1.59	.1139	Pearson V	
Second Wait Time	0.87	.3858	Gamma	BestFit = Gamma Critical Value=11.071 **$\chi^2 = 2.203$**
Provider Service Time	0.85	.3965	Pearson VI	
Total FPC Time	0.04	.97		

The response variable, representing the first wait time, was significantly different than the input variable (t= 3.78, df=100, p=0.0002, alpha level = .05). The other Pair-Wise t tests between the response and input variables were insignificant (alpha level = .05). In order to model the FPC, where the first wait time response and input variables would be insignificant, the screening service time and second wait time would have to be unrealistically reduced. The significant difference in the first wait time, as the status quo FPC is modeled, actually favors the FPC. The first wait time response variable of the Status Quo MedModel© is 4.49 minutes versus 6.57 minutes for the input data first wait time. The slightly more than two minute reduction in the simulation first wait time shows the FPC in a more favorable light. When the Status Quo MedModel© is compared to the alternative models, where the alternative models are significantly improved with regard to first wait time, then the alternative models will actually be much more improved. Thus, the model should be considered valid and, since the FPC staff acknowledged that the model represented reality, credible.

Ho: There is no significant difference between the FPC Status Quo MedModel© and the empirical data.

Ha: There is a significant difference between the FPC Status Quo MedModel© and the empirical data.

Failed to Reject Ho. The model is a valid and credible representation of the Family Practice Clinic status quo.

Figure 9 illustrates the time and condition dependent processes with regard to response and input variables.

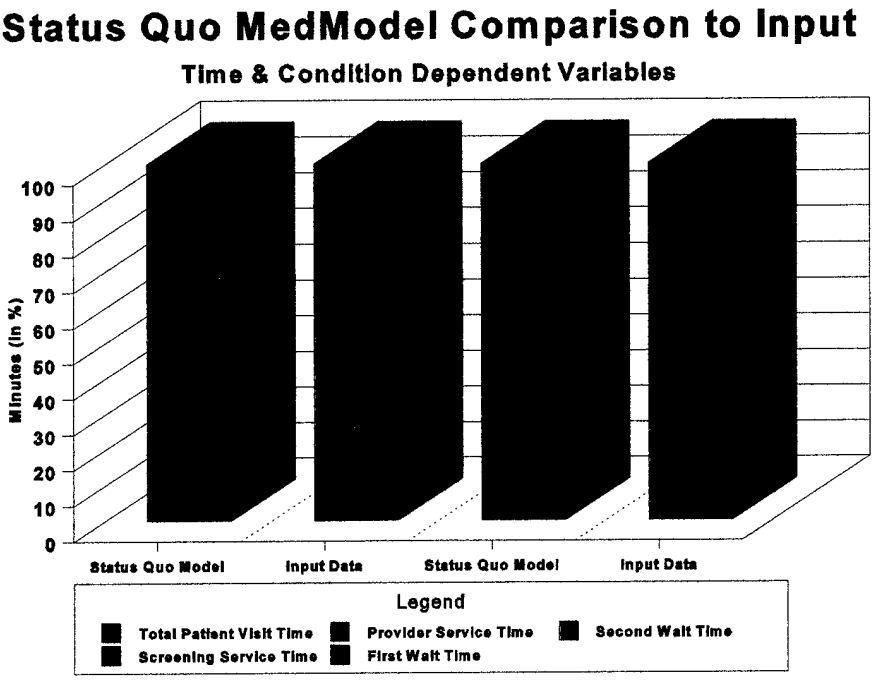


Figure 9. Comparison of Status Quo MedModel© Response Variables and FPC Input Variables.

Source: *Response Variables from Simulation and Empirical Data.*

Since the FPC status quo has been modeled validly and credibly, does the current status of resources and process configuration meet the capacity (in patient visits per year) for the enrollment goal? From the terminating simulation, the answer is definately no. The number of patient visits, with an aggregate provider utilization mean of 82.61%, is 36, 732. Since the goal is 48,372 annual patient visits; the shortfall is 11,640 visits. The provider utilization rate leaves little chance for the status quo to overcome the visit shortfall by changing processes in the FPC to realize greater provider utilization. The need for additional provider resources is obvious. The alternative models, the Physician

MedModel© and Combination MedModel©, increased provider resources to meet the annual patient visit capacity goal. Also, the alternative models attempted to improve the FPC processes to limit the increase in provider resources to meet the visit capacity goal within a more efficient clinic. With an increase in efficiency, HMEDDAC should be able to realize cost avoidance by not having to increase provider resources due to inefficient processes.

FIRST WAIT TIME

t-Test: Paired Two-Sample for Means	First Wait Time Status Quo Model	First Wait Time Empirical Data
Mean	**4.49**	**6.57**
Variance	0.17	30.00
Observations	101	101
Pearson Correlation	-0.06	
Pooled Variance	15.08	
Hypothesized Mean Difference	0	
df	**100**	
t	**-3.78**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha Level = .05	**Significant Difference**	

Descriptive Statistics	First Wait Time Status Quo Model	First Wait Time Empirical Data
Mean	**4.49**	**6.57**
Standard Error	0.04	0.54
Median	4.37	5.10
Mode	4.36	2.08
Standard Deviation	**0.41**	**5.48**
Variance	0.17	30.00
Kurtosis	2.14	6.92
Skewness	1.19	2.39
Range	2.24	30.37
Minimum	3.87	0.83
Maximum	6.11	31.20
Sum	453.84	663.63
Count	101.00	101.00
Confidence Level (0.950000)	0.08	1.07

Screening Service Time

t-Test: Paired Two-Sample for Means	Screening Service Time Status Quo Model	Screening Service Time Empirical Data
Mean	**4.76**	**4.46**
Variance	0.00	3.67
Observations	101	101
Pearson Correlation	-0.05	
Pooled Variance	1.84	
Hypothesized Mean Difference	0	
df	**100**	
t	**1.59**	
P(T<=t) one-tail	0.06	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.11**	
t Critical two-tail	**1.98**	
alpha level = .05	**No Significant Difference**	

Descriptive Statistics	Screening Service Time Status Quo Model	Screening Service Time Empirical Data
Mean	**4.76**	**4.46**
Standard Error	0.00	0.19
Median	4.76	3.98
Mode	4.77	2.17
Standard Deviation	**0.01**	**1.92**
Variance	0.00	3.67
Kurtosis	-0.26	2.65
Skewness	-0.42	1.43
Range	0.06	9.78
Minimum	4.73	1.42
Maximum	4.79	11.20
Sum	481.01	450.28
Count	101.00	101.00
Confidence Level(0.950000)	0.00	0.37

Second Wait Time

t-Test: Paired Two-Sample for Means	Second Wait Time Status Quo Model	Second Wait Time Empirical Data
Mean	**15.54**	**14.44**
Variance	2.88	158.75
Observations	101.00	101.00
Pearson Correlation	0.05	
Pooled Variance	80.81	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**0.87**	
P(T<=t) one-tail	0.19	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.39**	
t Critical two-tail	**1.98**	
alpha Level = .05	**No Significant Difference**	

Descriptive Statistics	Second Wait Time Status Quo Model	Second Wait Time Empirical Data
Mean	**15.54**	**14.44**
Standard Error	0.17	1.25
Median	15.46	11.90
Mode	13.33	0.33
Standard Deviation	**1.70**	**12.60**
Variance	2.88	158.75
Kurtosis	-0.38	1.80
Skewness	0.14	1.36
Range	7.99	57.45
Minimum	11.46	0.33
Maximum	19.45	57.78
Sum	1569.12	1458.55
Count	101.00	101.00
Confidence Level(0.950000)	0.33	2.46

Provider Service Time

t-Test: Paired Two-Sample for Means	Provider Service Time Status Quo Model	Provider Service Time Empirical Data
Mean	**16.88**	**16.14**
Variance	0.01	77.53
Observations	101.00	101.00
Pearson Correlation	0.08	
Pooled Variance	38.77	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**0.85**	
P(T<=t) one-tail	0.20	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.40**	
t Critical two-tail	**1.98**	
alpha= .05	**No Significant Difference**	

Descriptive Statistics	Provider Service Time Status Quo Model	Provider Service Time Empirical Data
Mean	**16.88**	**16.14**
Standard Error	0.01	0.88
Median	16.88	14.55
Mode	16.86	7.10
Standard Deviation	**0.07**	**8.81**
Variance	0.01	77.53
Kurtosis	-0.22	2.09
Skewness	0.21	1.40
Range	0.31	41.80
Minimum	16.75	3.62
Maximum	17.06	45.42
Sum	1705.12	1629.80
Count	101.00	101.00
Confidence Level (0.950000)	0.01	1.72

Total Time in FPC

t-Test: Paired Two-Sample for Means	Total Time in FPC Status Quo Model	Total Time in FPC Empirical Data
Mean	**41.67**	**41.61**
Variance	4.76	279.62
Observations	101.00	101.00
Pearson Correlation	0.02	
Pooled Variance	142.19	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**0.04**	
P(T<=t) one-tail	0.48	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.97**	
t Critical two-tail	**1.98**	
alpha= .05	**No Significant Difference**	

Descriptive Statistics	Total Time in FPC Status Quo Model	Total Time in FPC Empirical Data
Mean	**41.67**	**41.61**
Standard Error	0.22	1.66
Median	41.47	39.82
Mode	40.47	NA
Standard Deviation	**2.18**	**16.72**
Variance	4.76	279.62
Kurtosis	-0.23	0.79
Skewness	0.30	0.89
Range	10.60	81.53
Minimum	36.81	11.70
Maximum	47.41	93.23
Sum	4209.08	4202.27
Count	101.00	101.00
Confidence Level (0.950000)	0.43	3.26

Terminating Simulation

Descriptive Statistics	Provider Utilization Rate Status Quo Model	Total Patient Visits per Day Status Quo Model	Total Patient Visits per Year Status Quo Model	
Mean	**82.61%**	**141.28**	**36732.08**	**Clinic Days/Year (260)**
Standard Error	0.53	1.18		
Median	83.61	140.00		
Mode	77.02	140.00		
Standard Deviation	**5.30**	**11.90**		
Variance	28.14	141.68		
Kurtosis	-0.87	-0.19		
Skewness	-0.09	0.10		
Range	21.35	57.00		
Minimum	72.54	110.00		
Maximum	93.89	167.00		
Sum	8343.31	14269.00		
Count	101.00	101.00		
Confidence Level (0.950000)	1.03	2.32		
Confidence Intervals:				**Confidence Intervals:**
90.00%	**81.71% to 83.5%**	**139.26 to 143.29**	**36207.6 to 37255.4**	**90.00%**
95.00%	**81.53% to 83.69%**	**138.85 to 143.7**	**36101 to 37362**	**95.00%**
99.00%	**81.15% to 84.07%**	**138.0 to 144.55**	**35880 to 37583**	**99.00%**

Visits Short of Goal	*PATIENT VISIT GOAL:*
	Total Military and Family Member Beneficiary Enrollment =
11639.92	**48372**

Formatted Listing of Model:
C:\MMSTU\MODELS\TRAINING\NONT_SQ.MOD

Model Notes:

HMEDDAC Family Practice Clinic
Status Quo Model
Ledlow GMP
Characteristics:
6 Family Practice Physicians
Reception
1st Waiting Area
Screening Room
2d Waiting Area
Provider Service
- Exit
- Ancillaries
    * Lab
    * Radiology
    * Pharmacy

-Arrival Cycle to L(4.0225,5.4) to simulate full provider staff appointment utilization.

Time Units: Minutes
Distance Units: Feet

****

* **Locations** *

****

Name	Cap	Units	Stats	Rules
Reception	inf	1	Detailed	Oldest, ,
First_Wait_Area	10	5	Detailed	Oldest, , First
First_Wait_Area.1	10	1	Detailed	Oldest, ,
First_Wait_Area.2	10	1	Detailed	Oldest, ,
First_Wait_Area.3	10	1	Detailed	Oldest, ,
First_Wait_Area.4	10	1	Detailed	Oldest, ,
First_Wait_Area.5	10	1	Detailed	Oldest, ,
Screening_Room	1	2	Detailed	Oldest, , By turn
Screening_Room.1	1	1	Detailed	Oldest, ,
Screening_Room.2	1	1	Detailed	Oldest, ,
Second_Wait_Area	10	3	Detailed	Oldest, FIFO, First
Second_Wait_Area.1	7	1	Detailed	Oldest, FIFO,
Second_Wait_Area.2	8	1	Detailed	Oldest, FIFO,

Name	Cap	Units	Stats	Rules
Second_Wait Area.3	10	1	Detailed	Oldest, FIFO,
Exam_Room	6		Detailed	Oldest, FIFO, First
Exam_Room.1	1	1	Detailed	Oldest, FIFO,
Exam_Room.2	1	1	Detailed	Oldest, FIFO,
Exam_Room.3	1	1	Detailed	Oldest, FIFO,
Exam_Room.4	1	1	Detailed	Oldest, FIFO,
Exam_Room.5	1	1	Detailed	Oldest, FIFO,
Exam_Room.6	1	1	Detailed	Oldest, FIFO,
Radiology	15	1	Detailed	Oldest, ,
Laboratory	15	1	Detailed	Oldest, ,
Pharmacy	20	1	Detailed	Oldest, ,

Clock downtimes for Locations *

****

Location	Frequency	First Time	Priority	Scheduled	Disable	Logic
Screening_Room	24 hr	4.5 hr	90	No	No	wait 1.25 hr
Screening_Room.1	24 hr	4.5 hr	90	No	No	wait 1.25 hr
Screening_Room.2	24 hr	4.5 hr	90	No	No	wait 1.25 hr
Second_Wait_Area	24 hr	4.5 hr	90	Yes	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.75 hr
Second_Wait.1	24 hr	4.5 hr	90	Yes	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.75 hr
Second_Wait.2	24 hr	4.5 hr	90	Yes	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.75 hr
Second_Wait.3	24 hr	4.5 hr	90	Yes	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.75 hr
Exam_Room	24 hr	4.75 hr	90	Yes	Yes	wait .75 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.25 hr
Exam_Room.1	24 hr	4.75 hr	90	No	Yes	wait .75 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.25 hr
Exam_Room.2	24 hr	4.75 hr	90	No	Yes	wait .75 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.25 hr
Exam_Room.3	24 hr	4.75 hr	90	No	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.25 hr
Exam_Room.4	24 hr	4.75 hr	90	No	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.25 hr
Exam_Room.5	24 hr	4.75 hr	90	No	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.25 hr
Exam_Room.6	24 hr	4.75 hr	90	No	Yes	wait 1 hr
	24 hr	9.25 hr	90	No	Yes	wait 14.25 hr

Entities

Name	Speed (fpm)	Stats
Patient	114	Detailed
Patient2	114	Detailed

Resources

Name	Res Units	Res Stats	Ent Search	Search	Path	Motion
FP_Physician	6	By Unit	None	Oldest		Empty: 114 fpm Full: 114 fpm

Clock downtimes for Resources

Resource	Frequency	First Time	Priority	Scheduled	Node List	Disable Logic	
FP_Physician	24 hr	4.75 hr	90	Yes	all	Yes	wait 1 hr

* **Processing** *

		Process		Routing			
Entity	**Location**	**Operation**	**Blk**	**Output**	**Destination**	**Rule**	**Move**	**Exit Logic**
Patient	Reception	WAIT 1 MIN						
			1	Patient	First_Wait_Area	TURN 1		
Patient	First_Wait_Area		1	Patient	Screening_Room	MOST 1		
Patient	Screen_Room	WAIT P5(6.3, 25.24) MIN						
			1	Patient	Second_Waiting_Area	FIRST 1		
Patient	Second_Waiting_Area		1	Patient	Exam_Room	FIRST 1		
Patient	Exam_Room	Provider=1						
		GET FP_Physician						
		WAIT P6(14.82, 4.67, 4.18) MIN						
		FREE FP_Physician						
			1	Patient	Radiology	0.079200	1	
				Patient	Laboratory	0.099000		
				Patient	Pharmacy	0.712900		
				Patient	EXIT	0.108900		
				Patient	Radiology			
		RENAME Patient2						
		WAIT 15 MIN						
			1	Patient2	Exam_Room	0.049500	1	
				Patient2	EXIT	0.950500		
				Patient	Laboratory			
		RENAME Patient2						
		WAIT 15 MIN						
			1	Patient2	Exam_Room	0.049500	1	
				Patient2	EXIT	0.950500		
				Patient	Pharmacy			
		RENAME Patient2						
		WAIT 5 MIN						
			1	Patient2	Exam_Room	0.049500	1	
				Patient2	EXIT	0.950500		
Patient2	Exam_Room	GET FP_Physician						
		WAIT N(4.7567,2.8064) MIN						
		FREE FP_Physician						
			1	Patient2	EXIT	FIRST 1		
Patient2	ALL	GET FP_Physician						
		WAIT N(4.76,2.081) MIN						
		FREE FP_Physician						
			1	Patient2	EXIT	FIRST 1		

****

* **Arrivals** *

****

Entity	Location	Qty each	First Time	Occurrences	Frequency	Logic
Patient	Reception	1		inf		L(4.0225,5.4)

Formatted Listing of Model:
C:\MMSTU\MODELS\TRAINING\TERM_SQ.MOD

Model Notes:

HMEDDAC Family Practice Clinic **TERMINATING SIMULATION**
Status Quo Model
Ledlow GMP
Characteristics:
6 Family Practice Physicians
Reception
1st Waiting Area
Screening Room
2d Waiting Area
Provider Service
- Exit
- Ancillaries
    * Lab
    * Radiology
    * Pharmacy

-Arrival Cycle to L(4.0225,5.4) to simulate full provider staff appointment utilization.

Time Units: Minutes
Distance Units: Feet

****

* **Locations** *

****

Name	Cap	Units	Stats	Rules
Reception	inf	1	Detailed	Oldest, ,
First_Wait_Area	10	5	Detailed	Oldest, , First
First_Wait_Area.1	10	1	Detailed	Oldest, ,
First_Wait_Area.2	10	1	Detailed	Oldest, ,
First_Wait_Area.3	10	1	Detailed	Oldest, ,
First_Wait_Area.4	10	1	Detailed	Oldest, ,
First_Wait_Area.5	10	1	Detailed	Oldest, ,
Screening_Room	1	2	Detailed	Oldest, , By turn
Screening_Room.1	1	1	Detailed	Oldest, ,
Screening_Room.2	1	1	Detailed	Oldest, ,
Second_Wait_Area	10	3	Detailed	Oldest, FIFO, First
Second_Wait_Area.1	7	1	Detailed	Oldest, FIFO,
Second_Wait_Area.2	8	1	Detailed	Oldest, FIFO,

Name	Cap	Units	Stats	Rules
Second_Wait Area.3	10	1	Detailed	Oldest, FIFO,
Exam_Room	6		Detailed	Oldest, FIFO, First
Exam_Room.1	1	1	Detailed	Oldest, FIFO,
Exam_Room.2	1	1	Detailed	Oldest, FIFO,
Exam_Room.3	1	1	Detailed	Oldest, FIFO,
Exam_Room.4	1	1	Detailed	Oldest, FIFO,
Exam_Room.5	1	1	Detailed	Oldest, FIFO,
Exam_Room.6	1	1	Detailed	Oldest, FIFO,
Radiology	15	1	Detailed	Oldest, ,
Laboratory	15	1	Detailed	Oldest, ,
Pharmacy	20	1	Detailed	Oldest, ,

Clock downtimes for Locations *

****

Location	Frequency	First Time	Priority	Scheduled	Disable	Logic
Screening_Room	24 hr	4.5 hr	90	No	No	wait 1.25 hr
Screening_Room.1	24 hr	4.5 hr	90	No	No	wait 1.25 hr
Screening_Room.2	24 hr	4.5 hr	90	No	No	wait 1.25 hr
Second_Wait_Area	24 hr	4.5 hr	90	Yes	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.75 hr
Second_Wait.1	24 hr	4.5 hr	90	Yes	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.75 hr
Second_Wait.2	24 hr	4.5 hr	90	Yes	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.75 hr
Second_Wait.3	24 hr	4.5 hr	90	Yes	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.75 hr
Exam_Room	24 hr	4.75 hr	90	Yes	No	wait .75 hr
	24 hr	9.25 hr	90	No	No	wait 14.25 hr
Exam_Room.1	24 hr	4.75 hr	90	No	No	wait .75 hr
	24 hr	9.25 hr	90	No	No	wait 14.25 hr
Exam_Room.2	24 hr	4.75 hr	90	No	No	wait .75 hr
	24 hr	9.25 hr	90	No	No	wait 14.25 hr
Exam_Room.3	24 hr	4.75 hr	90	No	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.25 hr
Exam_Room.4	24 hr	4.75 hr	90	No	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.25 hr
Exam_Room.5	24 hr	4.75 hr	90	No	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.25 hr
Exam_Room.6	24 hr	4.75 hr	90	No	No	wait 1 hr
	24 hr	9.25 hr	90	No	No	wait 14.25 hr

Entities

Name	Speed (fpm)	Stats
Patient	114	Detailed
Patient2	114	Detailed

Resources

Name	Units	Res Stats	Ent Search	Search	Path	Motion
FP_Physician	6	By Unit	None	Oldest		Empty: 114 fpm Full: 114 fpm

Clock downtimes for Resources

Resource	Frequency	First Time	Priority	Scheduled	Node List	Disable Logic	
FP_Physician	24 hr	4.75 hr	90	Yes	all	No	wait 1 hr

* **Processing** *

		Process		Routing				
Entity	**Location**	**Operation**	**Blk**	**Output**	**Destination**	**Rule**	**Move**	**Exit Logic**
Patient	Reception	WAIT 1 MIN						
			1	Patient	First_Wait_Area	TURN 1		
Patient	First_Wait_Area		1	Patient	Screening_Room	MOST 1		
Patient	Screen_Room	WAIT P5(6.3, 25.24) MIN						
			1	Patient	Second_Waiting_Area	FIRST 1		
Patient	Second_Waiting_Area		1	Patient	Exam_Room	FIRST 1		
Patient	Exam_Room	Provider=1						
		GET FP_Physician						
		WAIT P6(14.82, 4.67, 4.18) MIN						
		FREE FP_Physician						
			1	Patient	Radiology	0.079200	1	
				Patient	Laboratory	0.099000		
				Patient	Pharmacy	0.712900		
				Patient	EXIT	0.108900		
				Patient	Radiology			
		RENAME Patient2						
		WAIT 15 MIN						
			1	Patient2	Exam_Room	0.049500	1	
				Patient2	EXIT	0.950500		
				Patient	Laboratory			
		RENAME Patient2						
		WAIT 15 MIN						
			1	Patient2	Exam_Room	0.049500	1	
				Patient2	EXIT	0.950500		
				Patient	Pharmacy			
		RENAME Patient2						
		WAIT 5 MIN						
			1	Patient2	Exam_Room	0.049500	1	
				Patient2	EXIT	0.950500		
Patient2	Exam_Room	GET FP_Physician						
		WAIT N(4.7567,2.8064) MIN						
		FREE FP_Physician						
			1	Patient2	EXIT	FIRST 1		
Patient2	ALL	GET FP_Physician						
		WAIT N(4.76,2.081) MIN						
		FREE FP_Physician						
			1	Patient2	EXIT	FIRST 1		

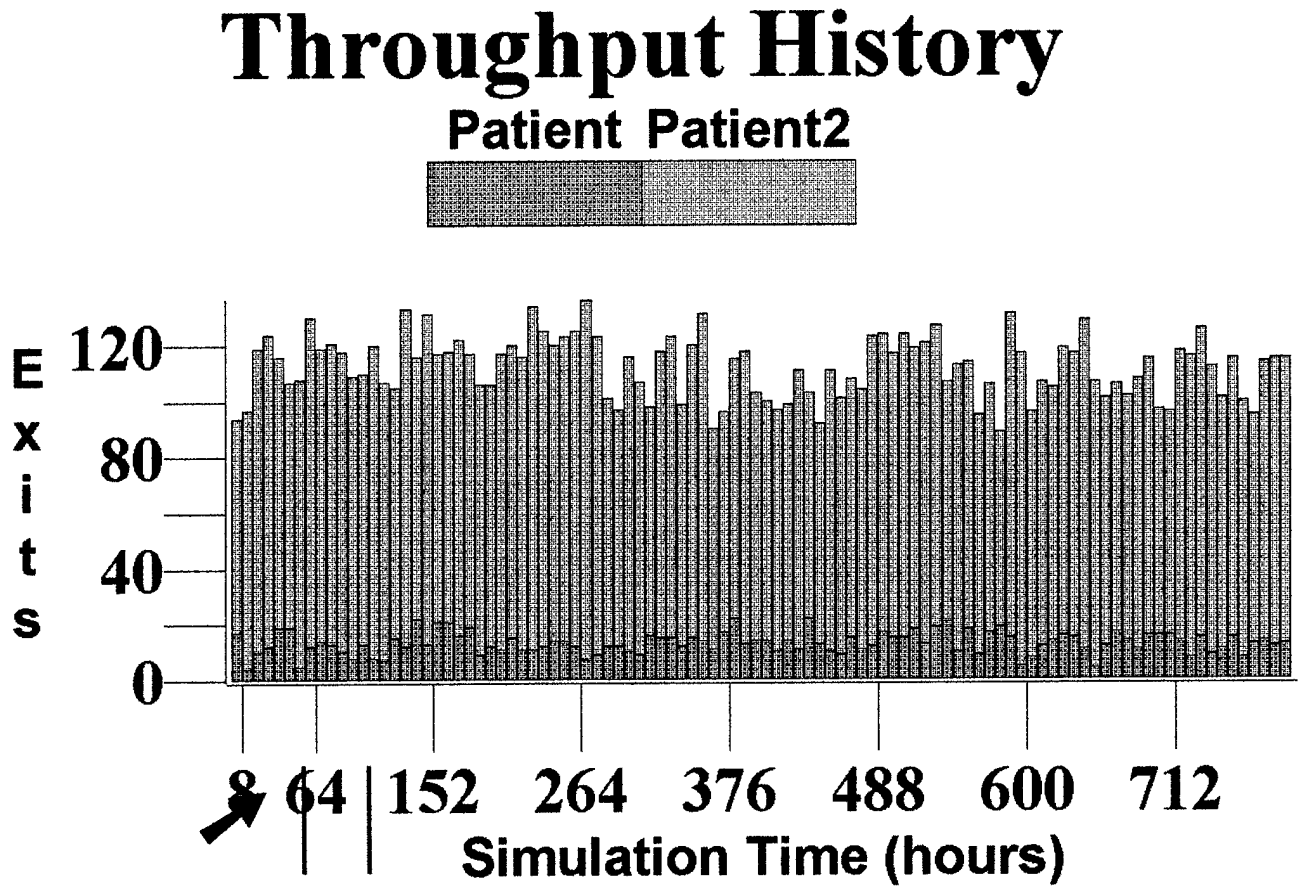
****

* **Arrivals** *

****

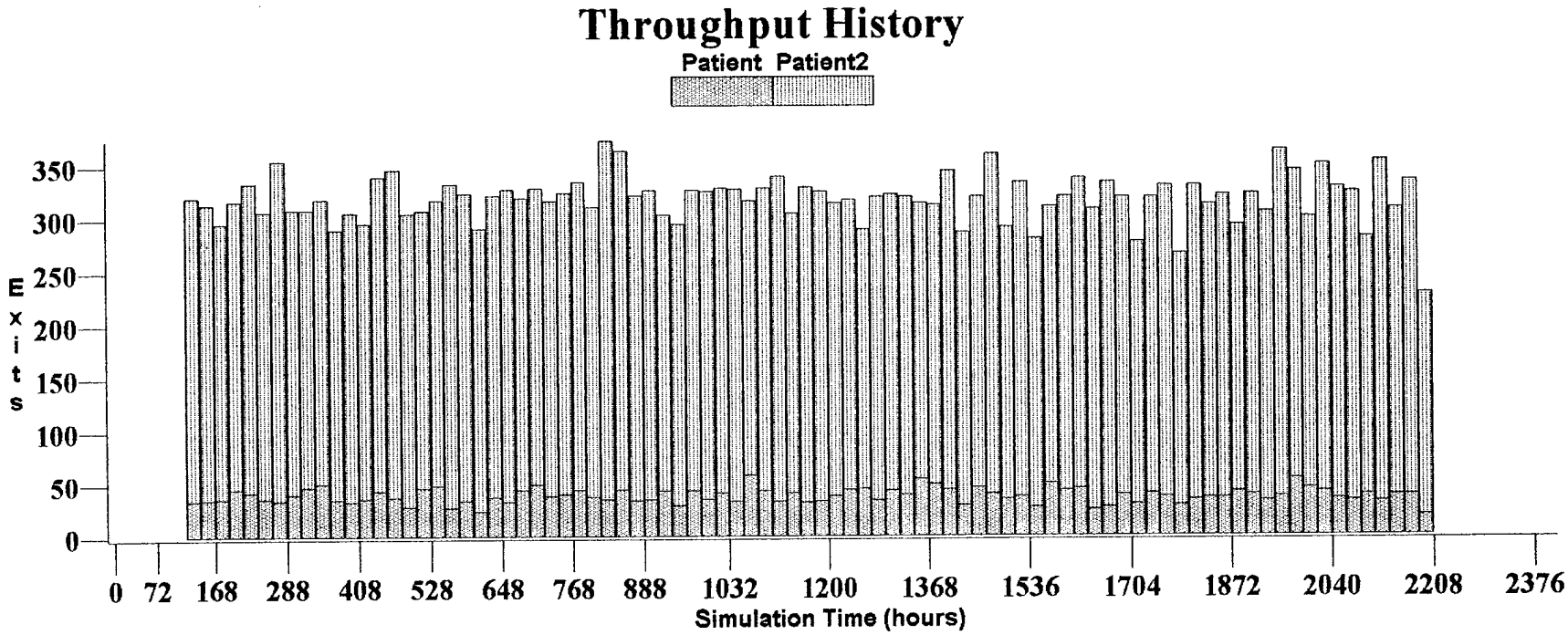
Entity	Location	Qty each	First Time	Occurrences	Frequency	Logic
Patient	Reception	1		inf		L(4.0225,5.4)

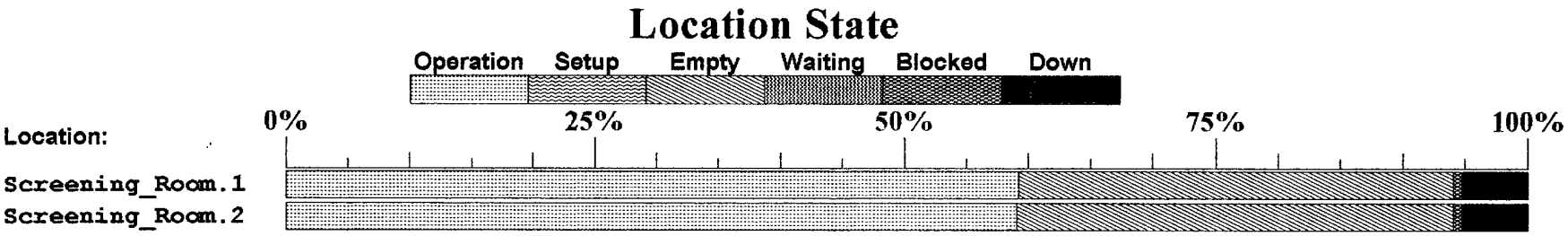
Throughput History

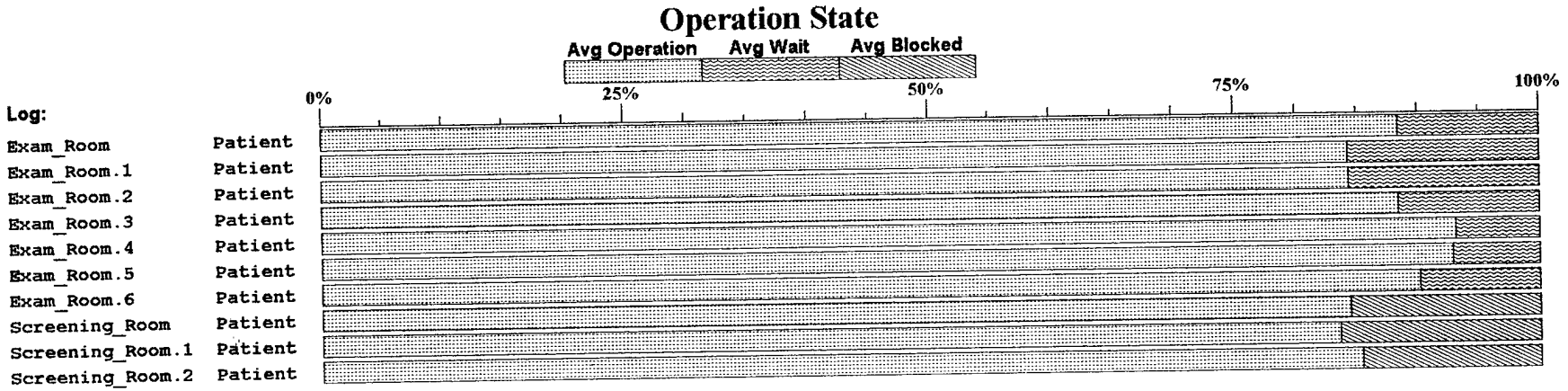


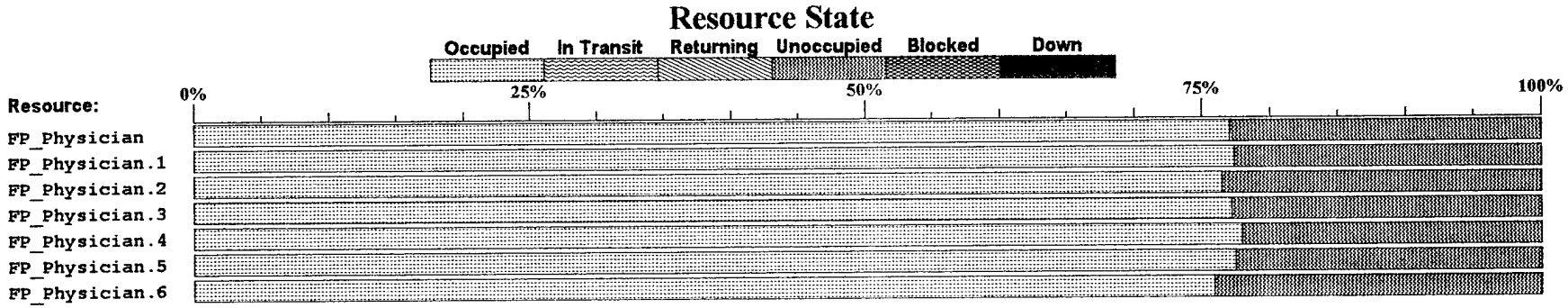
Stability at 92 hours **Warm-Up Period: 92Hrs X 130% =120 Hrs**

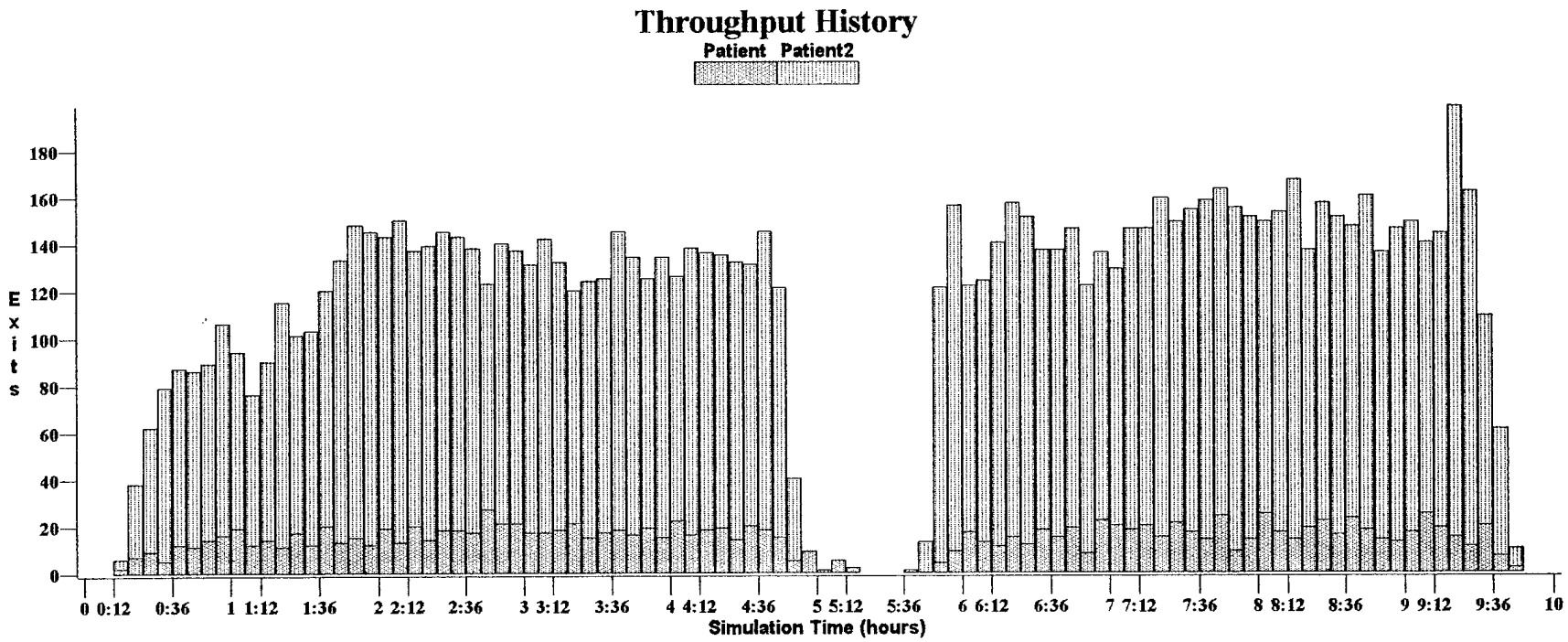
NonTerminating Simulation Warm-Up Period Illustration.


Throughput History
Patient Patient2
Exits
350
300
250
200
150
100
50
0
0 72 168 288 408 528 648 768 888 1032 1200 1368 1536 1704 1872 2040 2208 2376
Simulation Time (hours)


Location State
Operation
Setup
Empty
Waiting
Blocked
Down
Location:
0%
25%
50%
75%
100%
Screening_Room.1
Screening_Room.2


Operation State
Avg Operation
Avg Wait
Avg Blocked
0%
25%
50%
75%
100%
Log:
Exam_Room Patient
Exam_Room.1 Patient
Exam_Room.2 Patient
Exam_Room.3 Patient
Exam_Room.4 Patient
Exam_Room.5 Patient
Exam_Room.6 Patient
Screening_Room Patient
Screening_Room.1 Patient
Screening_Room.2 Patient


Resource State
Occupied
In Transit
Returning
Unoccupied
Blocked
Down
Resource:
0%
25%
50%
75%
100%
FP_Physician
FP_Physician.1
FP_Physician.2
FP_Physician.3
FP_Physician.4
FP_Physician.5
FP_Physician.6


Throughput History
Patient
Patient2
Exits
180
160
140
120
100
80
60
40
20
0
0 0:12
0:36
1 1:12
1:36
2 2:12
2:36
3 3:12
3:36
4 4:12
4:36
5 5:12
5:36
6 6:12
6:36
7 7:12
7:36
8 8:12
8:36
9 9:12
9:36
10
Simulation Time (hours)

APPENDIX 9

The Physician MedModel© employs eight Family Practice Physicians and is based on the Status Quo MedModel©. One change is the screening process is quasi-parallel rather than quasi-serial. The screening process is completed in the exam room, not a separate screening area.

This appendix illustrates the Physician MedModel©, the comparison to the Status Quo MedModel©, and the model program listing. Graphics are included to illustrate the various states, conditions, and resources of both the NonTerminating and Terminating models.

FIRST WAIT TIME

t-Test: Paired Two-Sample for Means	First Wait Time Status Quo Model	First Wait Time Physician MedModel
Mean	**4.49**	**11.71**
Variance	0.17	2.51
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	1.34	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**-61.52**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha Level = .05	**Significant Difference**	

Descriptive Statistics	First Wait Time Status Quo Model	First Wait Time Physician MedModel
Mean	**4.49**	**11.71**
Standard Error	0.04	0.16
Median	4.37	11.40
Mode	4.36	10.16
Standard Deviation	**0.41**	**1.58**
Variance	0.17	2.51
Kurtosis	2.14	0.02
Skewness	1.19	0.65
Range	2.24	7.49
Minimum	3.87	8.89
Maximum	6.11	16.38
Sum	453.84	1182.56
Count	101.00	101.00
Confidence Level (0.950000)	0.08	0.31

Confidence Intervals:	
90.00%	**11.44 to 11.98 minutes**
95.00%	**11.38 to 12.03 minutes**
99.00%	**11.27 to 12.15 minutes**

Screening Service Time

t-Test: Paired Two-Sample for Means	Screening Service Time Status Quo Model	Screening Service Time Physician MedModel
Mean	**4.76**	**4.66**
Variance	0.00	0.00
Observations	101.00	101.00
Pearson Correlation	0.93	
Pooled Variance	0.00	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**213.27**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Screening Service Time Status Quo Model	Screening Service Time Physician MedModel
Mean	**4.76**	**4.66**
Standard Error	0.00	0.00
Median	4.76	4.66
Mode	4.77	4.66
Standard Deviation	**0.01**	**0.01**
Variance	0.00	0.00
Kurtosis	-0.26	0.02
Skewness	-0.42	-0.37
Range	0.06	0.05
Minimum	4.73	4.63
Maximum	4.79	4.68
Sum	481.01	470.84
Count	101.00	101.00
Confidence Level (0.950000)	0.00	0.00

Confidence Intervals:	
90.00%	**4.66 to 4.6635 minutes**
95.00%	**4.659 to 4.6638 minutes**
99.00%	**4.65895 to 4.66456 minutes**

Second Wait Time

t-Test: Paired Two-Sample for Means	Second Wait Time Status Quo Model	Second Wait Time Physician MedModel
Mean	**15.54**	**7.57**
Variance	2.88	0.05
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	1.46	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**54.48**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha Level = .05	**Significant Difference**	

Descriptive Statistics	Second Wait Time Status Quo Model	Second Wait Time Physician MedModel
Mean	**15.54**	**7.57**
Standard Error	0.17	0.02
Median	15.46	7.58
Mode	13.33	7.42
Standard Deviation	**1.70**	**0.23**
Variance	2.88	0.05
Kurtosis	-0.38	-0.23
Skewness	0.14	-0.03
Range	7.99	1.18
Minimum	11.46	6.99
Maximum	19.45	8.17
Sum	1569.12	764.84
Count	101.00	101.00
Confidence Level (0.950000)	0.33	0.04

Confidence Intervals:

90.00%	**7.53 to 7.61 minutes**
95.00%	**7.526 to 7.62 minutes**
99.00%	**7.51 to 7.64 minutes**

Provider Service Time

t-Test: Paired Two-Sample for Means	Provider Service Time Status Quo Model	Provider Service Time Physician MedModel
Mean	**16.88**	**16.88**
Variance	0.01	0.00
Observations	101.00	101.00
Pearson Correlation	0.98	
Pooled Variance	0.00	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**2.75**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.01**	
t Critical two-tail	**1.98**	
alpha= .05	**Significant Difference**	

Descriptive Statistics	Provider Service Time Status Quo Model	Provider Service Time Physician MedModel
Mean	**16.88**	**16.88**
Standard Error	0.01	0.01
Median	16.88	16.87
Mode	16.86	16.85
Standard Deviation	**0.07**	**0.05**
Variance	0.01	0.00
Kurtosis	-0.22	0.35
Skewness	0.21	0.44
Range	0.31	0.29
Minimum	16.75	16.74
Maximum	17.06	17.03
Sum	1705.12	1704.44
Count	101.00	101.00
Confidence Level(0.950000)	0.01	0.01

Confidence Intervals:	
90.00%	**16.867 to 16.885 minutes**
95.00%	**16.866 to 16.887 minutes**
99.00%	**16.862 to 16.891 minutes**

Total Time in FPC

t-Test: Paired Two-Sample for Means	Total Time in FPC Status Quo Model	Total Time in FPC Physician MedModel
Mean	**41.67**	**40.82**
Variance	4.76	3.50
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	4.13	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**22.71**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	0.00	
t Critical two-tail	**1.98**	
alpha= .05	**Significant Difference**	

Descriptive Statistics	Total Time in FPC Status Quo Model	Total Time in FPC Physician MedModel
Mean	**41.67**	**40.82**
Standard Error	0.22	0.19
Median	41.47	40.51
Mode	40.47	40.40
Standard Deviation	**2.18**	**1.87**
Variance	4.76	3.50
Kurtosis	-0.23	-0.05
Skewness	0.30	0.56
Range	10.60	9.01
Minimum	36.81	37.25
Maximum	47.41	46.26
Sum	4209.08	4122.68
Count	101.00	101.00
Confidence Level (0.950000)	0.43	0.36

Terminating Simulation

Provider Utilization Rate (% Occupied in Patient Exam)

t-Test: Paired Two-Sample for Means	Provider Utilization Rate Status Quo Model	Provider Utilization Rate Physician MedModel
Mean	**82.61**	**72.01**
Variance	28.14	47.01
Observations	101.00	101.00
Pearson Correlation	0.97	
Pooled Variance	37.68	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**56.33**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Provider Utilization Rate Status Quo Model	Provider Utilization Rate Physician MedModel
Mean	**82.61%**	**72.01**
Standard Error	0.53	0.68
Median	83.61	72.11
Mode	77.02	69.95
Standard Deviation	**5.30**	**6.86**
Variance	28.14	47.01
Kurtosis	-0.87	0.60
Skewness	-0.09	-0.56
Range	21.35	34.78
Minimum	72.54	51.32
Maximum	93.89	86.10
Sum	8343.31	7273.02
Count	101.00	101.00
Confidence Level (0.950000)	1.03	1.34

Confidence Intervals:		
90.00%	**81.71% to 83.5%**	**70.85% to 73.17%**
95.00%	**81.53% to 83.69%**	**70.61% to 73.41%**
99.00%	**81.15% to 84.07%**	**70.12% to 73.89%**

Terminating Simulation

Patient Visit Capacity

t-Test: Paired Two-Sample for Means	Total Patient Visits per Day Status Quo Model	Total Patient Visits per Day Physician MedModel
Mean	**141.28**	**186.09**
Variance	141.68	208.45
Observations	101.00	100.00
Pearson Correlation	NA	
Pooled Variance	194.44	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**-107.21**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Total Patient Visits per Day Status Quo Model	Total Patient Visits per Day Physician MedModel
Mean	**141.28**	**186.09**
Standard Error	1.18	1.44
Median	140.00	185.00
Mode	140.00	185.00
Standard Deviation	**11.90**	**14.44**
Variance	141.68	208.45
Kurtosis	-0.19	0.03
Skewness	0.10	0.41
Range	57.00	70.00
Minimum	110.00	156.00
Maximum	167.00	226.00
Sum	14269.00	18609.00
Count	101.00	100.00
Confidence Level (0.950000)	2.32	2.83

Confidence Intervals:	Patient Visits/Day	
90.00%	**139.26 to 143.29**	**184.3 to 189.84**
95.00%	**138.85 to 143.7**	**183.73 to 190.41**
99.00%	**138.0 to 144.55**	**182.57 to 191.57**

PATIENT VISIT GOAL: Visit Capacity/Year **Total Military and Family Member Beneficiary Enrollment =**	Mean X 260 Clinic Days per Year	Mean X 260 Clinic Days per Year
48372	**36732.08**	**48383.40**
	Does Not Meet Goal	**Meets Goal**

Formatted Listing of Model:
C:\MMSTU\MODELS\TRAINING\NTERM_PM.MOD

****

Model Notes:

Physician Medmodel Alternative 1

Reception
First Wait Area
Exam Room
- Screening (Screening Completed in Exam Room (Edwards et al., Quasi-Parallel Process))
- Exam
- Ancillary or Exit

Ancillary (ancillary is not shown/used due to MedModel Constraints)
- Lab
- Rad
- Pharm

8 Physicians to Service 10294 enrolled beneficiaries
approximately 48372 visits per year
Time Units: Minutes
Distance Units: Feet

****
* **Locations** *
****

Name	Cap	Units	Stats	Rules
Reception	inf	1	Detailed	Oldest, FIFO,
Waiting_Area	50	1	Detailed	Oldest, FIFO,
Exam_Room	1	16	Detailed	Oldest, , First
Exam_Room.1	1	1	Detailed	Oldest, ,
Exam_Room.2	1	1	Detailed	Oldest, ,
Exam_Room.3	1	1	Detailed	Oldest, ,
Exam_Room.4	1	1	Detailed	Oldest, ,
Exam_Room.5	1	1	Detailed	Oldest, ,
Exam_Room.6	1	1	Detailed	Oldest, ,
Exam_Room.7	1	1	Detailed	Oldest, ,
Exam_Room.8	1	1	Detailed	Oldest, ,
Exam_Room.9	1	1	Detailed	Oldest, ,
Exam_Room.10	1	1	Detailed	Oldest, ,
Exam_Room.11	1	1	Detailed	Oldest, ,

Exam_Room.12	1	1	Detailed	Oldest, ,
Exam_Room.13	1	1	Detailed	Oldest, ,
Exam_Room.14	1	1	Detailed	Oldest, ,
Exam_Room.15	1	1	Detailed	Oldest, ,
Exam_Room.16	1	1	Detailed	Oldest, ,

****

* Clock downtimes for Locations *

****

Loc	Frequency	First Time	Priority	Scheduled	Disable	Logic
Exam_Room	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.1	24 hr	4.75	90	Yes	Yes	wait 1 hr
Exam_Room.2	24 hr	4.75	90	Yes	Yes	wait 1 hr
Exam_Room.3	24 hr	4.75	90	Yes	Yes	wait 1 hr
Exam_Room.4	24 hr	4.75	90	Yes	Yes	wait 1 hr
Exam_Room.5	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.6	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.7	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.8	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.9	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.10	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.11	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.12	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.13	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.14	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.15	24 hr	4.75	90	Yes	Yes	Wait 1 hr
Exam_Room.16	24 hr	4.75	90	Yes	Yes	Wait 1 hr

****

* **Entities** *

****

Name	Speed (fpm)	Stats
Patient	114	Detailed
Patient2	114	Detailed

Resources

Name	Resource Units	Stats	Entity Search	Search	Path	Motion
FP_Physician	8	By Unit	None	Oldest		Empty: 114 fpm Full: 114 fpm

Clock downtimes for Resources

Res	Frequency	First Time	Priority	Scheduled	Node List	Disable	Logic
FP_Physician	24 hr	4.75	90	Yes		Yes	wait 1 hr

Processing

Entity	Location	Process Operation	Blk	Routing Output	Destination	Rule	Move	Exit Logic
Patient	Reception	wait 1 min	1	Patient	Waiting_Area	MOST	1	
Patient	Waiting_Area		1	Patient	Screening_Room	MOST	1	
Patient	Exam_Room	Wait P5(6.3,25.24) GET FP_Physician Wait P6(14.82,4.67,4.18) FREE FP_Physician	1	Patient	EXIT	MOST	1	

****
* **Arrivals** *
****

Entity	Location	Qty each	First Time	Occurrences	Frequency	Logic
Patient	Reception	1		inf		L(3.15,3.6)

Formatted Listing of Model:
C:\MMSTU\MODELS\TRAINING\TERM_PMM.MOD

****

Model Notes: **TERMINATING SIMULATION**

Physician Medmodel Alternative 1

Reception
First Wait Area
Exam Room
- Screening (Screening Completed in Exam Room (Edwards et al., Quasi-Parallel Process))
- Exam
- Ancillary or Exit

Ancillary (ancillary is not shown/used due to MedModel Constraints)
- Lab
- Rad
- Pharm

8 Physicians to Service 10294 enrolled beneficiaries
approximately 48372 visits per year
Time Units: Minutes
Distance Units: Feet

****
* **Locations** *
****

Name	Cap	Units	Stats	Rules
Reception	inf	1	Detailed	Oldest, FIFO,
Waiting_Area	50	1	Detailed	Oldest, FIFO,
Exam_Room	1	16	Detailed	Oldest, , First
Exam_Room.1	1	1	Detailed	Oldest, ,
Exam_Room.2	1	1	Detailed	Oldest, ,
Exam_Room.3	1	1	Detailed	Oldest, ,
Exam_Room.4	1	1	Detailed	Oldest, ,
Exam_Room.5	1	1	Detailed	Oldest, ,
Exam_Room.6	1	1	Detailed	Oldest, ,
Exam_Room.7	1	1	Detailed	Oldest, ,
Exam_Room.8	1	1	Detailed	Oldest, ,
Exam_Room.9	1	1	Detailed	Oldest, ,
Exam_Room.10	1	1	Detailed	Oldest, ,

Exam_Room.11	1	1	Detailed	Oldest, ,
Exam_Room.12	1	1	Detailed	Oldest, ,
Exam_Room.13	1	1	Detailed	Oldest, ,
Exam_Room.14	1	1	Detailed	Oldest, ,
Exam_Room.15	1	1	Detailed	Oldest, ,
Exam_Room.16	1	1	Detailed	Oldest, ,

****

* Clock downtimes for Locations *

****

Loc	Frequency	First Time	Priority	Scheduled	Disable	Logic
Exam_Room	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.1	24 hr	4.75	90	Yes	No	wait 1 hr
Exam_Room.2	24 hr	4.75	90	Yes	No	wait 1 hr
Exam_Room.3	24 hr	4.75	90	Yes	No	wait 1 hr
Exam_Room.4	24 hr	4.75	90	Yes	No	wait 1 hr
Exam_Room.5	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.6	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.7	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.8	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.9	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.10	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.11	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.12	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.13	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.14	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.15	24 hr	4.75	90	Yes	No	Wait 1 hr
Exam_Room.16	24 hr	4.75	90	Yes	No	Wait 1 hr

****

* **Entities** *

****

Name	Speed (fpm)	Stats
Patient	114	Detailed
Patient2	114	Detailed

Resources

Name	Resource Units	Stats	Entity Search	Search	Path	Motion
FP_Physician	8	By Unit	None	Oldest		Empty: 114 fpm Full: 114 fpm

Clock downtimes for Resources

Res	Frequency	First Time	Priority	Scheduled	Node List	Disable	Logic
FP_Physician	24 hr	4.75	90	Yes		No	wait 1 hr

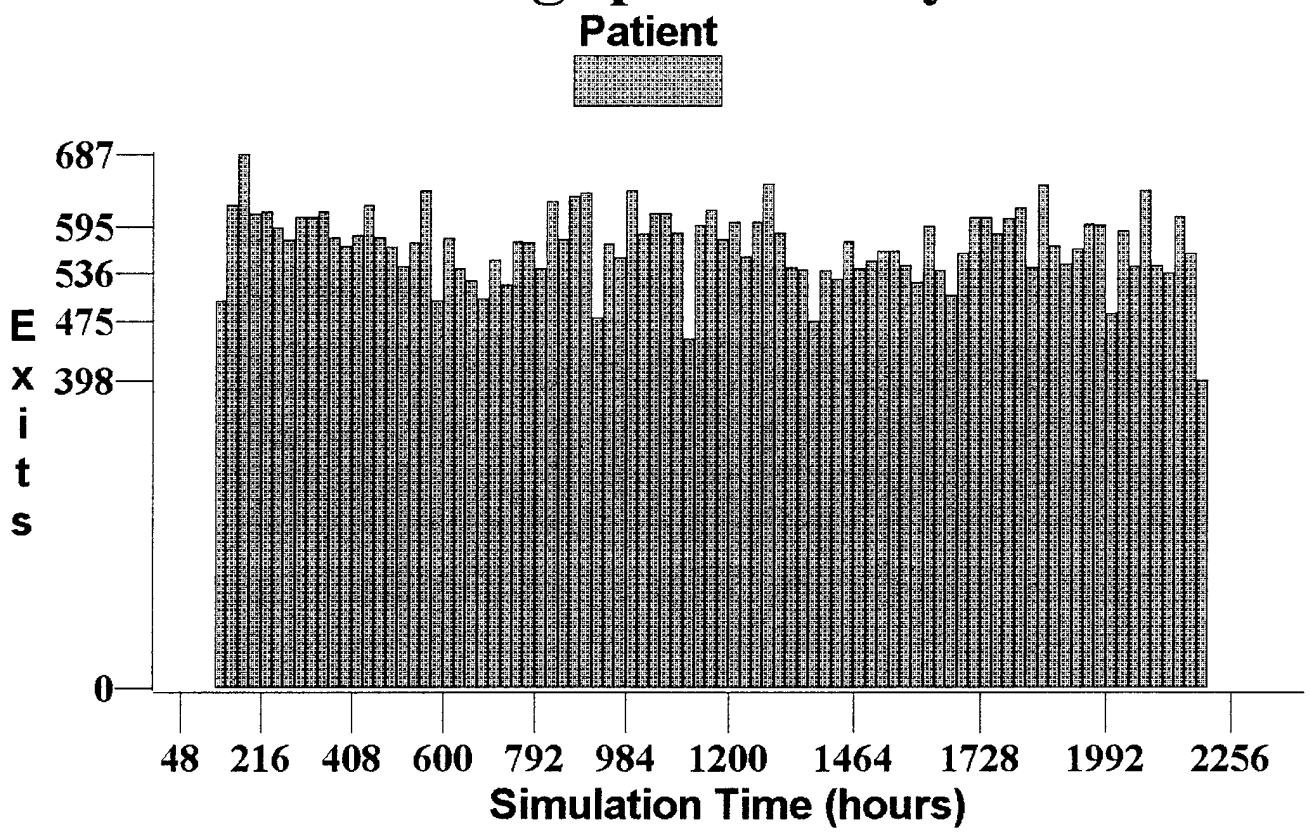
Processing

Entity	Location	Process Operation	Blk	Output	Destination	Routing Rule	Move	Exit Logic
Patient	Reception	wait 1 min	1	Patient	Waiting_Area	MOST	1	
Patient	Waiting_Area		1	Patient	Screening_Room	MOST	1	
Patient	Exam_Room	Wait P5(6.3, 25.24) GET FP_Physician Wait P6(14.82,4.67,4.18) FREE FP_Physician	1	Patient	EXIT	MOST	1	

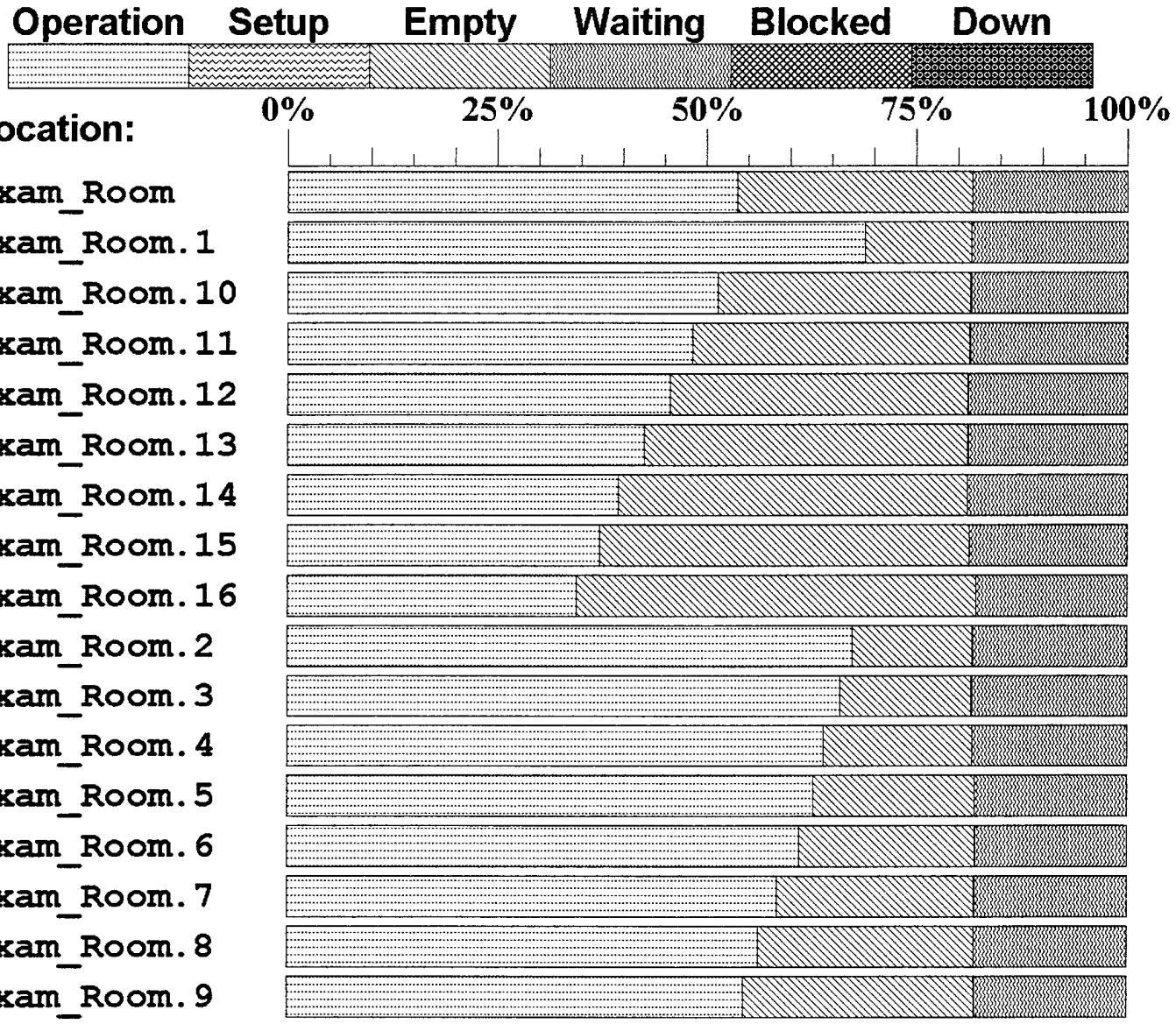
****
* **Arrivals** *
****

Entity	Location	Qty each	First Time	Occurrences	Frequency	Logic
Patient	Reception	1		inf		L(3.15,3.6)

Throughput History



Location State



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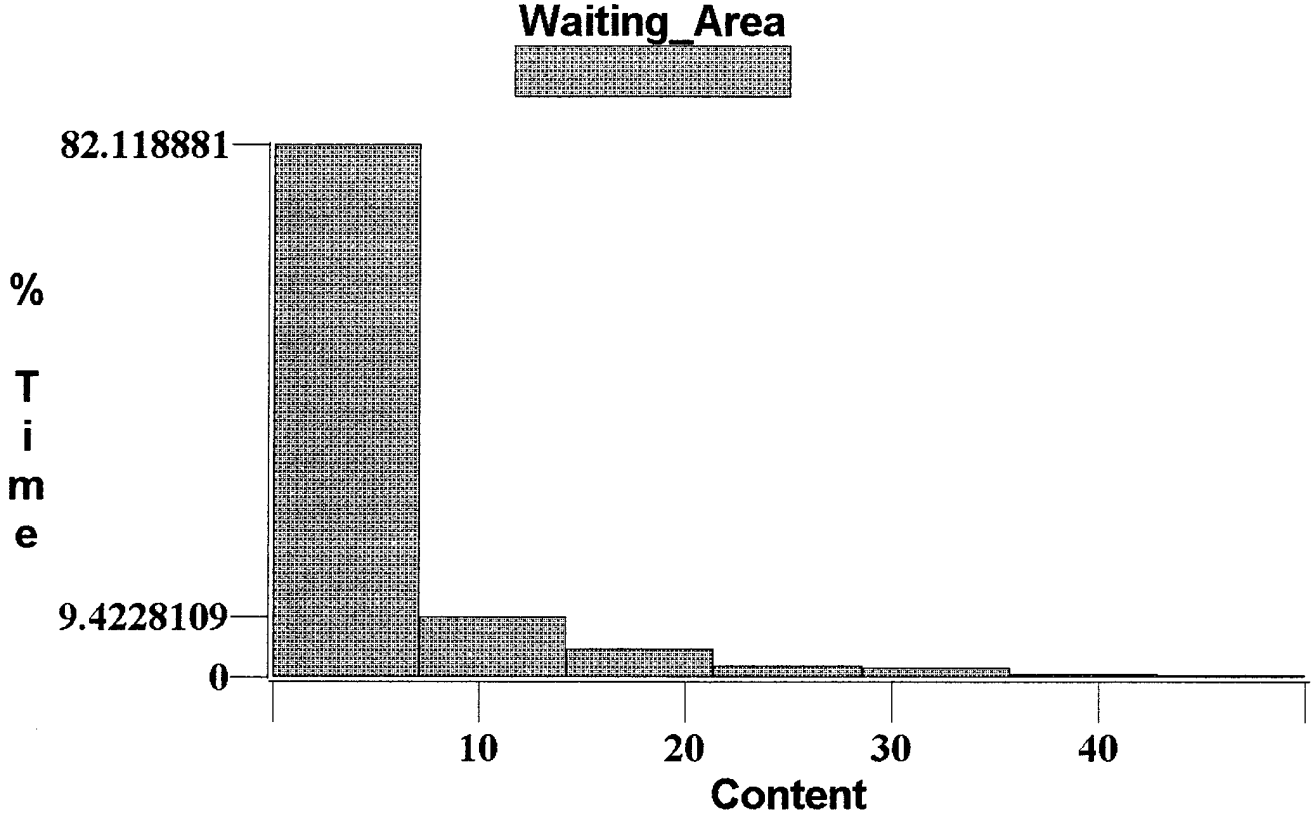
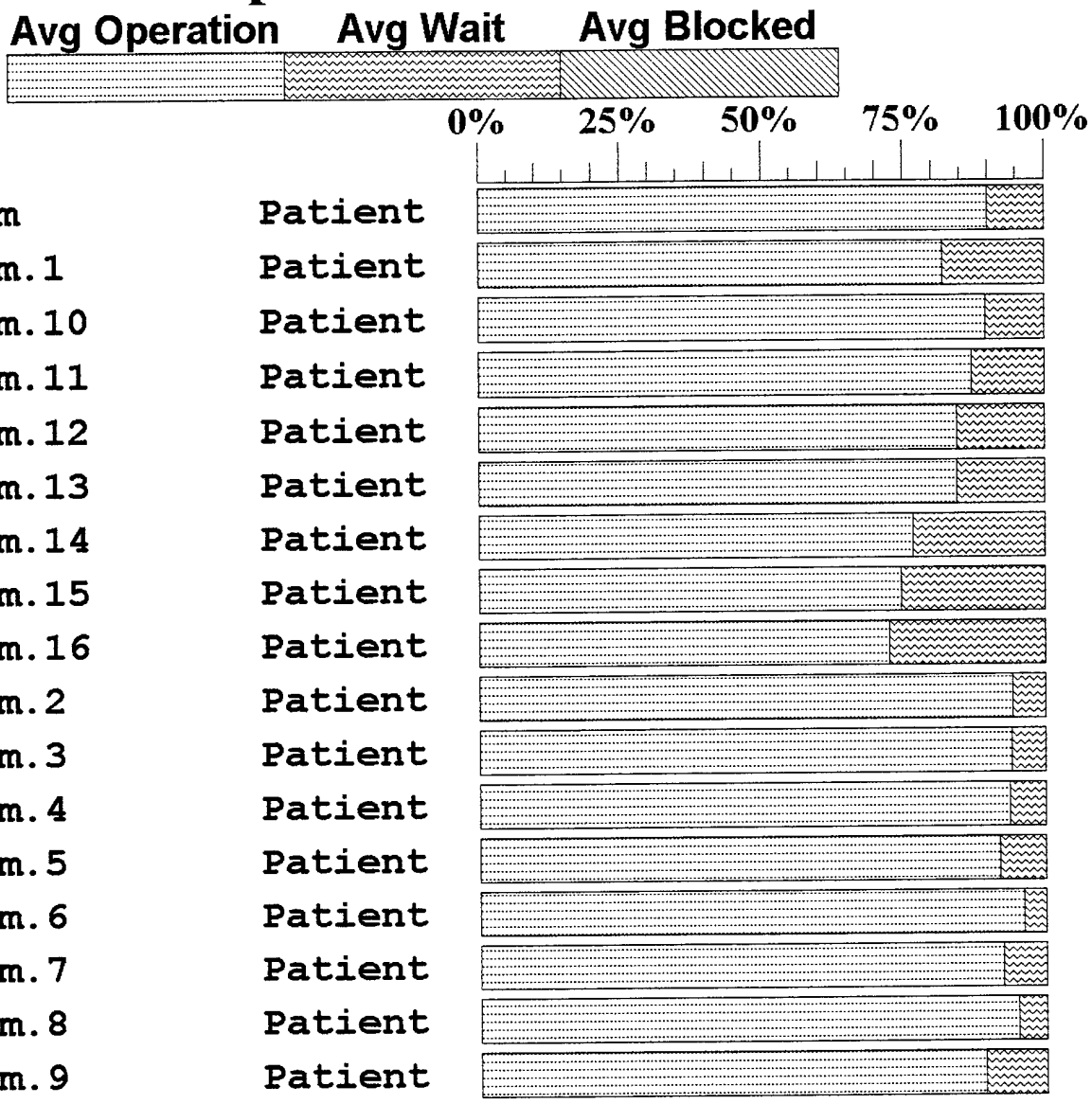


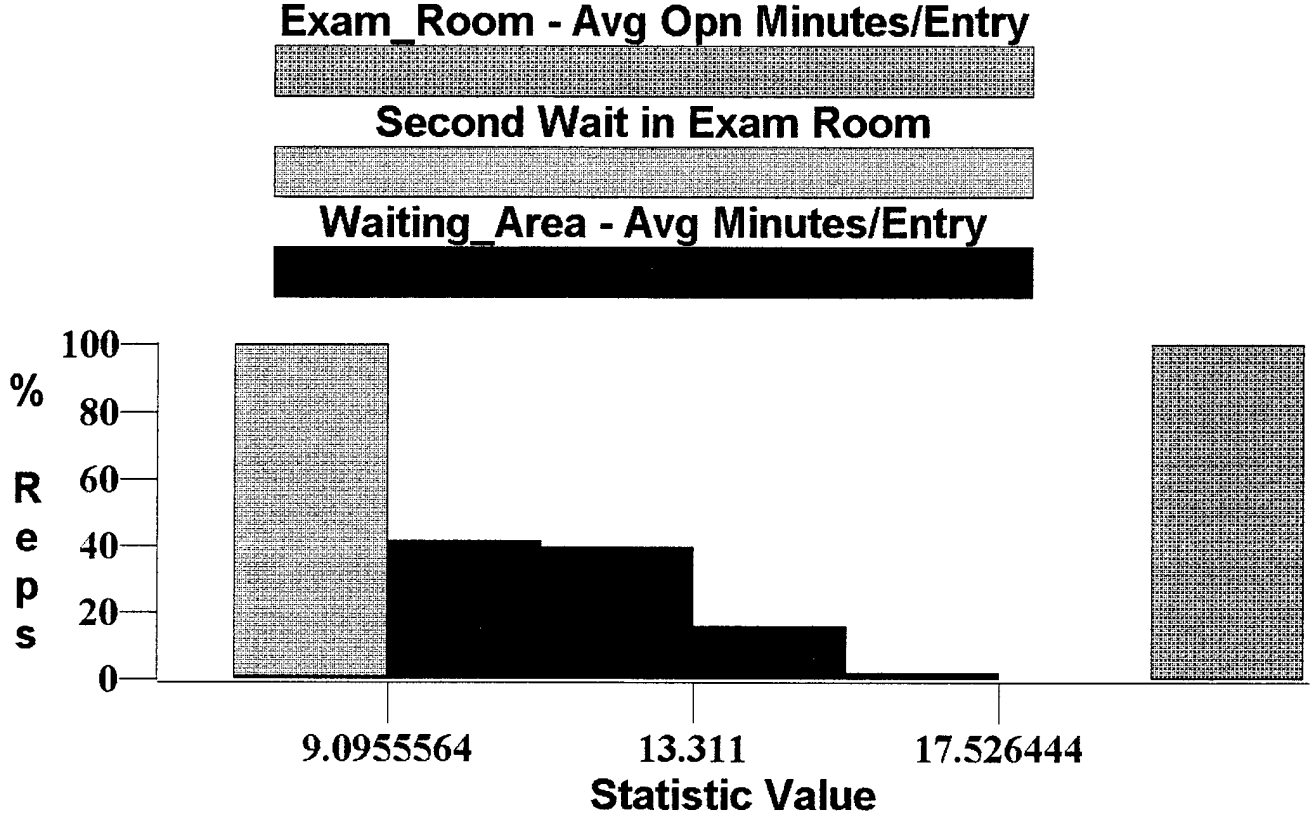
Operation State



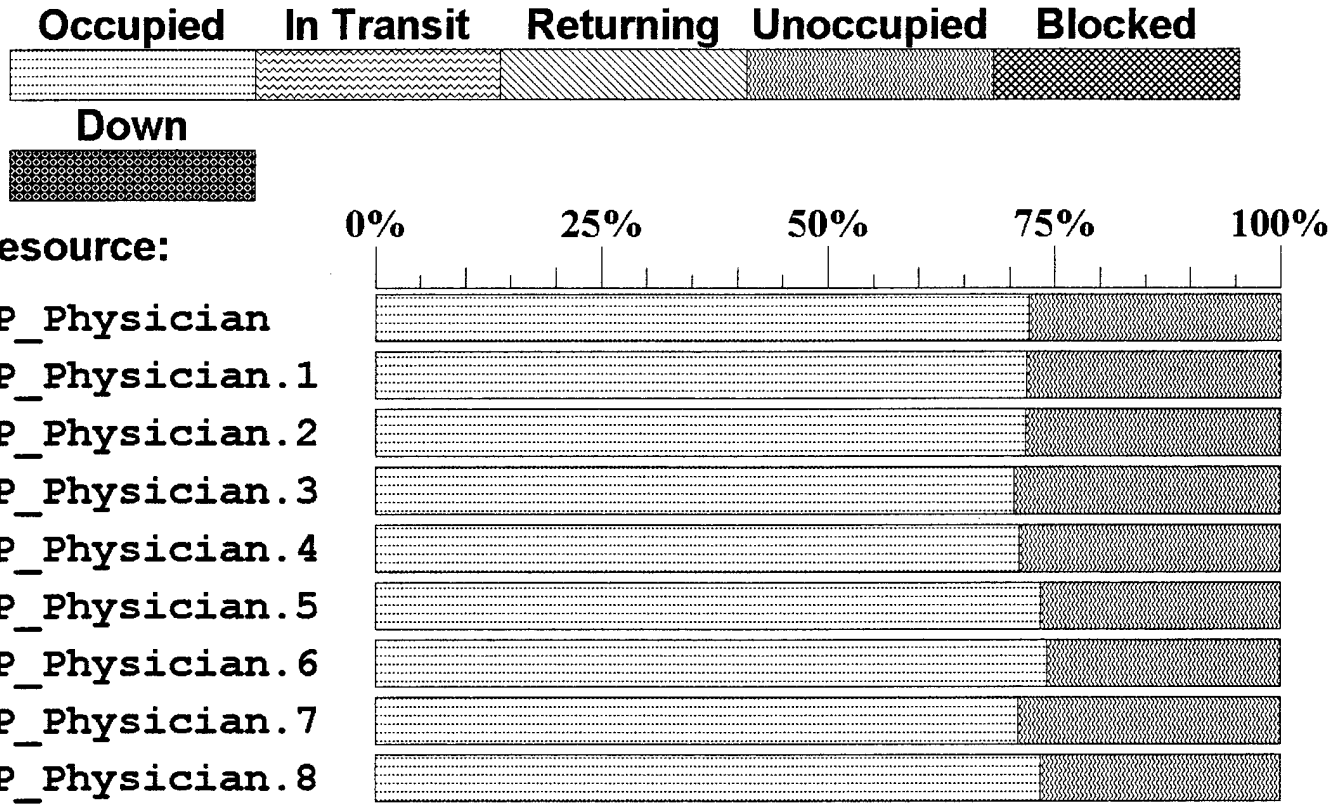
Log:

Exam_Room	Patient
Exam_Room.1	Patient
Exam_Room.10	Patient
Exam_Room.11	Patient
Exam_Room.12	Patient
Exam_Room.13	Patient
Exam_Room.14	Patient
Exam_Room.15	Patient
Exam_Room.16	Patient
Exam_Room.2	Patient
Exam_Room.3	Patient
Exam_Room.4	Patient
Exam_Room.5	Patient
Exam_Room.6	Patient
Exam_Room.7	Patient
Exam_Room.8	Patient
Exam_Room.9	Patient

Multiple Replication Histogram



Resource State



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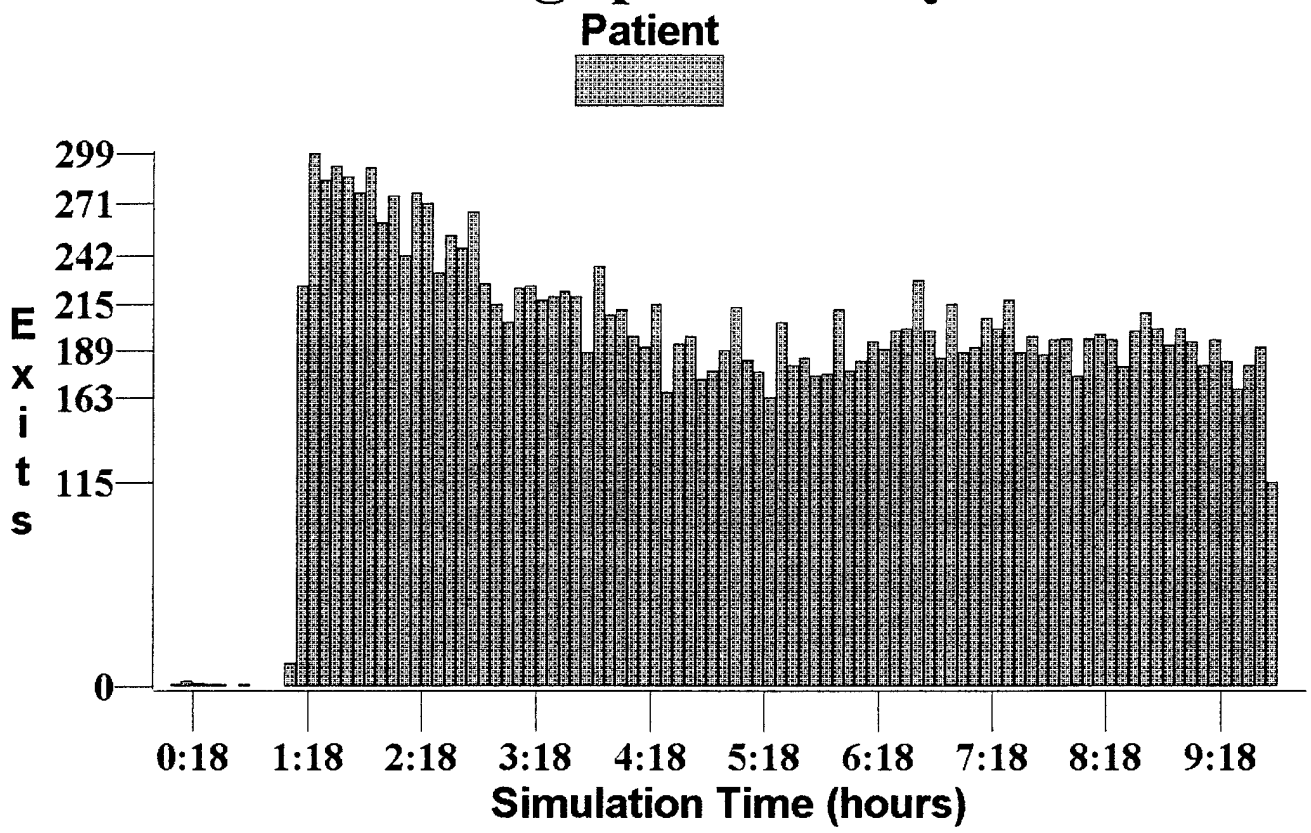

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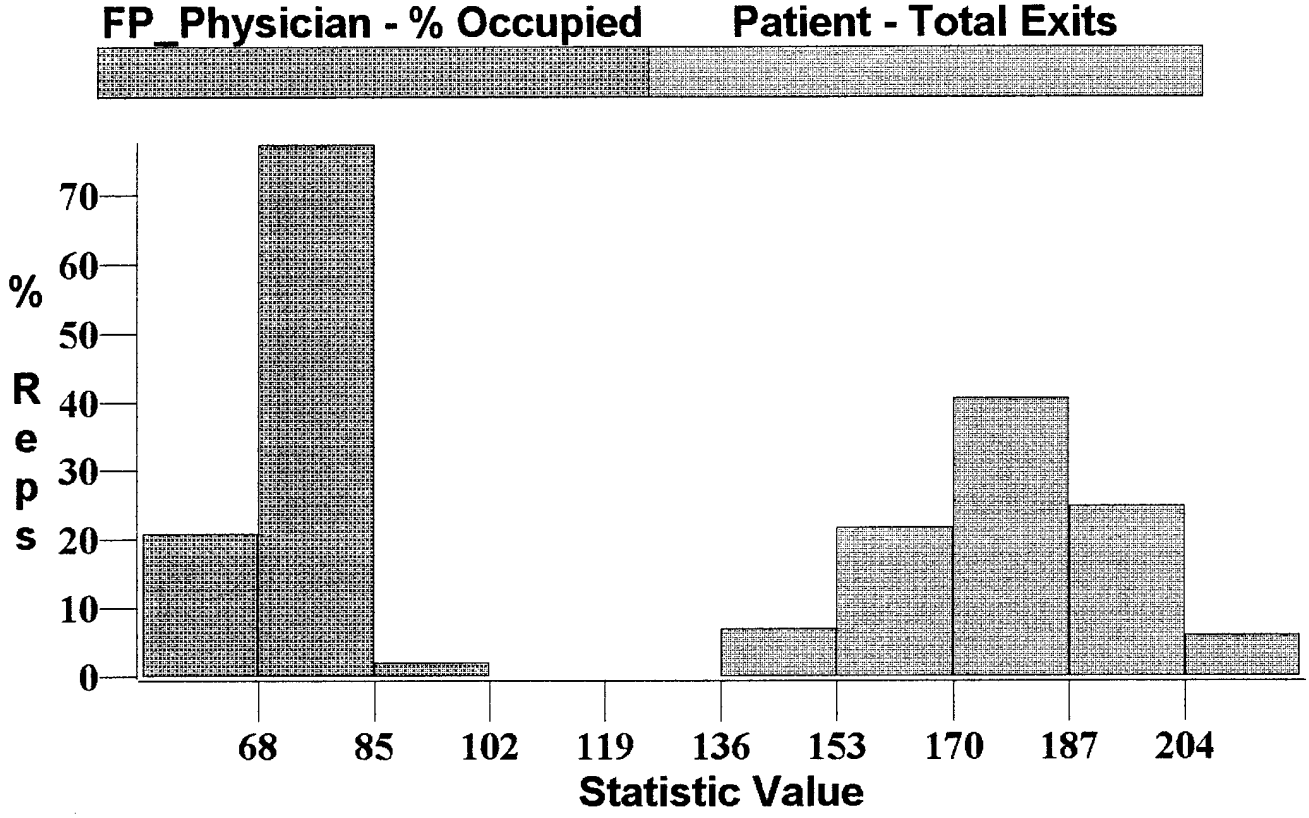


INPUT VARIABLES

	PHYSICIAN	PHYSICIAN EXTENDER
% Pts Able to Service	100.00%	72.00%
PANEL SIZE	1300	1300
ANNUAL SALARY*	$97,211.00	$64,001.00

* MEPRs Replacement Cost

ENROLLED BENEFICIARIES (or Projected)

	AD	ADFM	Ret/FM	DAC/FM	Current Residual
	3777	6222	1136	5005	295
Include =1 do not = 0	1	1	0	0	1

Residual = 293 Retirees and 2 DACs.

REQUIREMENTS	PHYSICIANs	PHYSICIAN EXTENDERs
	8	0

TOTAL ENROLLED: 10294

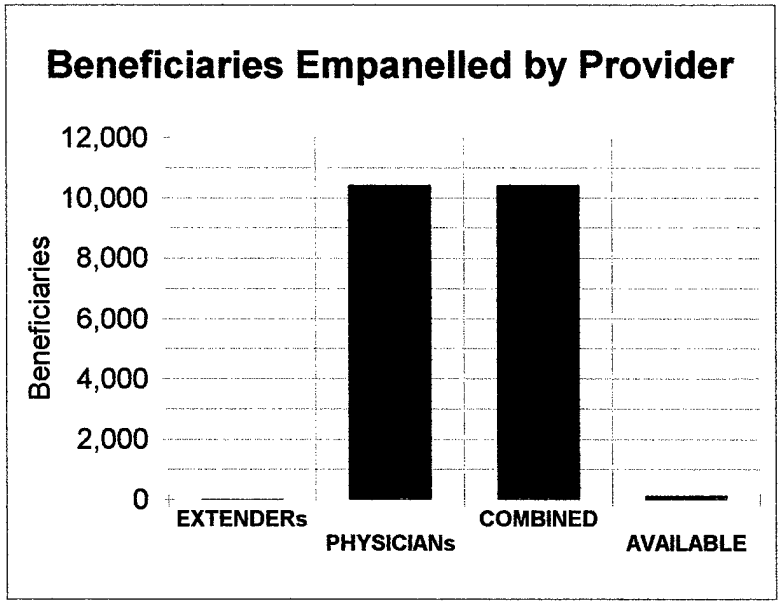
TOTAL ANNUAL COST: $777,688.00

PER BENEFICIARY COST: $75.55

ATTRIBUTED TO PROVIDER COST

PHYSICIAN EXTENDERs	PHYSICIANs	COST
0	7.92	$769,761.56
1	7.20	$763,770.64
2	6.48	$757,779.72
3	5.76	$751,788.80
4	5.04	$745,797.88
5	4.32	$739,806.96
6	3.60	$733,816.04
7	2.88	$727,825.12
8	2.16	$721,834.20
9	1.44	$715,843.28
10	0.72	$709,852.36

* Includes Part-Time



PHYSICIAN EXTENDERs Beneficiaries in Panel	PHYSICIANs Beneficiaries in Panel	COMBINED TOTAL COVERAGE	AVAILABLE POTENTIAL SLACK
0	10400	10400	106

***NOTE: Constraint: Physician Extenders cannot outnumber Physicians.**

COST FIGURES: Physicians are considered GS-13 Step 5, Physician Extenders are considered GS-11 Step 5.
COST SOURCE: USAREUR Cir 37-11, Change 1 and Supplement, Grades are IAW USAREUR CPO Guidelines.

APPENDIX 10

The Combination MedModel© employs five Family Practice Physicians and four Physician Extenders and is based on the Status Quo MedModel©. One change is the screening process is quasi-parallel rather than quasi-serial. The screening process is completed in the exam room, not a separate screening area.

This appendix illustrates the Combination MedModel©, the comparison to the Status Quo MedModel©, and the model program listing. Graphics are included to illustrate the various states, conditions, and resources of both the NonTerminating and Terminating models.

FIRST WAIT TIME

t-Test: Paired Two-Sample for Means	First Wait Time Status Quo Model	First Wait Time Combination MedModel
Mean	**4.49**	**4.49**
Variance	0.17	0.10
Observations	101.00	101.00
Pearson Correlation	0.96	
Pooled Variance	0.13	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**0.47**	
P(T<=t) one-tail	0.32	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.64**	
t Critical two-tail	**1.98**	
alpha Level = .05	**No Significant Difference**	

Descriptive Statistics	First Wait Time Status Quo Model	First Wait Time Combination MedModel
Mean	**4.49**	**4.49**
Standard Error	0.04	0.03
Median	4.37	4.51
Mode	4.36	4.12
Standard Deviation	**0.41**	**0.31**
Variance	0.17	0.10
Kurtosis	2.14	-0.31
Skewness	1.19	0.02
Range	2.24	1.52
Minimum	3.87	3.83
Maximum	6.11	5.35
Sum	453.84	453.16
Count	101.00	101.00
Confidence Level (0.950000)	0.08	0.06

Confidence Intervals:	
90.00%	**4.43 to 4.54 minutes**
95.00%	**4.42 to 4.55 minutes**
99.00%	**4.40 to 4.57 minutes**

Screening Service Time

t-Test: Paired Two-Sample for Means	Screening Service Time Status Quo Model	Screening Service Time Combination MedModel
Mean	**4.76**	**4.66**
Variance	0.00	0.00
Observations	101.00	101.00
Pearson Correlation	0.91	
Pooled Variance	0.00	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**199.67**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Screening Service Time Status Quo Model	Screening Service Time Combination MedModel
Mean	**4.76**	**4.66**
Standard Error	0.00	0.00
Median	4.76	4.66
Mode	4.77	4.66
Standard Deviation	**0.01**	**0.01**
Variance	0.00	0.00
Kurtosis	-0.26	0.93
Skewness	-0.42	-0.33
Range	0.06	0.06
Minimum	4.73	4.63
Maximum	4.79	4.69
Sum	481.01	470.88
Count	101.00	101.00
Confidence Level (0.950000)	0.00	0.00

Confidence Intervals:	
90.00%	**4.661 to 4.6635 minutes**
95.00%	**4.6589 to 4.6638 minutes**
99.00%	**4.65893 to 4.665 minutes**

Second Wait Time

t-Test: Paired Two-Sample for Means	Second Wait Time Status Quo Model	Second Wait Time Combination MedModel
Mean	**15.54**	**3.39**
Variance	2.88	0.02
Observations	101.00	101.00
Pearson Correlation	1.00	
Pooled Variance	1.45	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**77.93**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha Level = .05	**Significant Difference**	

Descriptive Statistics	Second Wait Time Status Quo Model	Second Wait Time Combination MedModel
Mean	**15.54**	**3.39**
Standard Error	0.17	0.01
Median	15.46	3.39
Mode	13.33	3.39
Standard Deviation	**1.70**	**0.13**
Variance	2.88	0.02
Kurtosis	-0.38	-0.25
Skewness	0.14	0.12
Range	7.99	0.67
Minimum	11.46	3.03
Maximum	19.45	3.70
Sum	1569.12	342.20
Count	101.00	101.00
Confidence Level (0.950000)	0.33	0.03

Confidence Intervals:	
90.00%	**3.37 to 3.41 minutes**
95.00%	**3.36 to 3.414 minutes**
99.00%	**3.35 to 3.42 minutes**

Provider Service Time

t-Test: Paired Two-Sample for Means	Provider Service Time Status Quo Model	Provider Service Time Combination MedModel
Mean	**16.88**	**16.89**
Variance	0.01	0.01
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	0.01	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**-7.19**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha= .05	**Significant Difference**	

Descriptive Statistics	Provider Service Time Status Quo Model	Provider Service Time Combination MedModel
Mean	**16.88**	**16.89**
Standard Error	0.01	0.01
Median	16.88	16.89
Mode	16.86	16.85
Standard Deviation	**0.07**	**0.07**
Variance	0.01	0.01
Kurtosis	-0.22	0.04
Skewness	0.21	0.11
Range	0.31	0.35
Minimum	16.75	16.72
Maximum	17.06	17.07
Sum	1705.12	1705.99
Count	101.00	101.00
Confidence Level (0.950000)	0.01	0.01

Confidence Intervals:	
90.00%	**16.887 to 16.9 minutes**
95.00%	**16.871 to 16.912 minutes**
99.00%	**16.865 to 16.908 minutes**

Total Time in FPC

t-Test: Paired Two-Sample for Means	Total Time in FPC Status Quo Model	Total Time in FPC Combination MedModel
Mean	**41.67**	**29.66**
Variance	4.76	1.46
Observations	101.00	101.00
Pearson Correlation	0.51	
Pooled Variance	3.11	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**64.37**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha= .05	**Significant Difference**	

Descriptive Statistics	Total Time in FPC Status Quo Model	Total Time in FPC Combination MedModel
Mean	**41.67**	**29.66**
Standard Error	0.22	0.12
Median	41.47	29.47
Mode	40.47	29.67
Standard Deviation	**2.18**	**1.21**
Variance	4.76	1.46
Kurtosis	-0.23	10.86
Skewness	0.30	3.12
Range	10.60	7.15
Minimum	36.81	28.21
Maximum	47.41	35.36
Sum	4209.08	2996.03
Count	101.00	101.00
Confidence Level (0.950000)	0.43	0.24

Terminating Simulation

Provider Utilization Rate (% Occupied in Patient Exam)

t-Test: Paired Two-Sample for Means	Provider Utilization Rate Status Quo Model	Provider Utilization Rate Combination MedModel
Mean	**82.61**	**66.41**
Variance	28.14	60.27
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	44.20	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**61.60**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Provider Utilization Rate Status Quo Model	Provider Utilization Rate Combination MedModel
Mean	**82.61%**	**66.41**
Standard Error	0.53	0.77
Median	83.61	66.70
Mode	77.02	NA
Standard Deviation	**5.30**	**7.76**
Variance	28.14	60.27
Kurtosis	-0.87	0.08
Skewness	-0.09	-0.05
Range	21.35	40.56
Minimum	72.54	46.75
Maximum	93.89	87.31
Sum	8343.31	6707.79
Count	101.00	101.00
Confidence Level (0.950000)	1.03	1.51

Confidence Intervals:	
90.00%	**65.09% to 67.74%**
95.00%	**64.821% to 68.01%**
99.00%	**64.27% to 68.562%**

Terminating Simulation

Patient Visit Capacity

t-Test: Paired Two-Sample for Means	Total Patient Visits per Day Status Quo Model	Total Patient Visits per Day Combination MedModel
Mean	**141.28**	**193.64**
Variance	141.68	359.67
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	250.68	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**-71.44**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Total Patient Visits per Day Status Quo Model	Total Patient Visits per Day Combination MedModel
Mean	**141.28**	**193.64**
Standard Error	1.18	1.89
Median	140.00	193.00
Mode	140.00	184.00
Standard Deviation	**11.90**	**18.97**
Variance	141.68	359.67
Kurtosis	-0.19	0.29
Skewness	0.10	-0.10
Range	57.00	103.00
Minimum	110.00	139.00
Maximum	167.00	242.00
Sum	14269.00	19558.00
Count	101.00	101.00
Confidence Level (0.950000)	2.32	3.70

Confidence Intervals:	Patient Visits/Day	
90.00%	139.26 to 143.29	190.42 to 196.87
95.00%	138.85 to 143.7	189.76 to 197.53
99.00%	138.0 to 144.55	188.4 to 198.89

PATIENT VISIT GOAL: Visit Capacity/Year Total Military and Family Member Beneficiary Enrollment =	Mean X 260 Clinic Days per Year	Mean X 260 Clinic Days per Year
48372	36732.08	50347.33
	DOES NOT MEET GOAL	MEETS GOAL (not Revised)

REVISED ANNUAL VISIT GOAL for Combination MedModel Patient Visit Goal X 1.12 (12% of PE Patients see Physician)	DOES NOT MEET REVISED GOAL
51032.46	Shortage of: 685.13

Formatted Listing of Model:
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Model Notes:

Combination Medmodel Alternative 2

Reception
First Wait Area
Exam Room
- Screening
- Exam
- Ancillary or Exit

Ancillary (ancillary is not shown\used due to MedModel Constraints)
- Lab
- Rad
- Pharm

5 Physicians and 4 Extenders to Service 10294 enrolled beneficiaries approximately 48355 visits per year. Since 12% of Physician Extender patients see FP_Physician also; Revised annual Patient Visit Goal of 54,177 visits.

Patient 1 sees FP_Physician
Patient 2 sees Physician Extender
Patient 3 sees Physician Extender then FP_Physician (12.4%)
Time Units: Minutes
Distance Units: Feet

****
* **Locations** *
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Name	Cap	Units	Stats	Rules	
Reception		inf	1	Detailed	Oldest, FIFO,
Waiting_Area		50	1	Detailed	Oldest, FIFO,
Exam_Room		1	10	Detailed	Oldest, , First
Exam_Room.1		1	1	Detailed	Oldest, ,
Exam_Room.2		1	1	Detailed	Oldest, ,
Exam_Room.3		1	1	Detailed	Oldest, ,
Exam_Room.4		1	1	Detailed	Oldest, ,
Exam_Room.5		1	1	Detailed	Oldest, ,

Exam_Room.6	1	1	Detailed	Oldest, ,
Exam_Room.7	1	1	Detailed	Oldest, ,
Exam_Room.8	1	1	Detailed	Oldest, ,
Exam_Room.9	1	1	Detailed	Oldest, ,
Exam_Room.10	1	1	Detailed	Oldest, ,
PE_Exam_Room	1	8	Detailed	Oldest, , First
PE_Exam_Room.1	1	1	Detailed	Oldest, ,
PE_Exam_Room.2	1	1	Detailed	Oldest, ,
PE_Exam_Room.3	1	1	Detailed	Oldest, ,
PE_Exam_Room.4	1	1	Detailed	Oldest, ,
PE_Exam_Room.5	1	1	Detailed	Oldest, ,
PE_Exam_Room.6	1	1	Detailed	Oldest, ,
PE_Exam_Room.7	1	1	Detailed	Oldest, ,
PE_Exam_Room.8	1	1	Detailed	Oldest, ,

****

* **Clock downtimes for Locations** *

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Loc	Frequency	First Time	Priority	Scheduled	Disable	Logic
Exam_Room	24 hr	4.75 hr	90	Yes	Yes	Wait 1 hr
Exam_Room.1	24 hr	4.75 hr	90	Yes	Yes	wait 1 hr
Exam_Room.2	24 hr	4.75 hr	90	Yes	Yes	wait 1 hr
Exam_Room.3	24 hr	4.75 hr	90	Yes	Yes	wait 1 hr
Exam_Room.4	24 hr	4.75 hr	90	Yes	Yes	wait 1 hr
Exam_Room.5	24 hr	4.75 hr	90	Yes	Yes	Wait 1 hr
Exam_Room.6	24 hr	4.75 hr	90	Yes	Yes	Wait 1 hr
Exam_Room.7	24 hr	4.75 hr	90	Yes	Yes	Wait 1 hr
Exam_Room.8	24 hr	4.75 hr	90	Yes	Yes	Wait 1 hr
Exam_Room.9	24 hr	4.75 hr	90	Yes	Yes	Wait 1 hr
Exam_Room.10	24 hr	4.75 hr	90	Yes	Yes	Wait 1 hr
PE_Exam_Room	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.1	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.2	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.3	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.4	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.5	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.6	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.7	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr
PE_Exam_Room.8	24 hr	4.75 hr	90	Yes	Yes	WAIT 1 hr

Entities

Name	Speed (fpm)	Stats
Patient	114	Detailed
Patient2	114	Detailed
Patient3	114	Detailed

Resources

Name	Units	Resource Stats	Entity Search	Search	Path	Motion
FP_Physician	5	By Unit	Least Used	Oldest		Empty: 114 fpm Full: 114 fpm
Physician_Extender	4	By Unit	Least Used	Oldest		Empty: 114 fpm Full: 114 fpm

Clock downtimes for Resources

Res	Frequency	First Time	Priority	Scheduled	Node List	Disable Logic
FP_Physician	24 hr	4.75 hr	90	Yes		Yes wait 1 hr
Physician_Extender	24 hr	4.75 hr	90	Yes		Yes wait 1 hr

****

* **Processing** *

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Entity	Location	Process Operation	Blk	Output	Routing Destination	Rule	Move	Exit Logic
Patient	Reception	wait 1 min	1	Patient	Waiting_Area	FIRST	1	
Patient	Waiting_Area		1	Patient	Exam_Room	0.555600	1	
				Patient	PE_Exam_Room	0.444400		
Patient	Exam_Room	PROVIDER=1 WAIT P5(6.3,25.24) MIN GET FP_Physician Wait P6(14.82,4.67,4.18) FREE FP_Physician						
			1	Patient	EXIT	MOST	1	
Patient	PE_Exam_Room	Provider=2 RENAME AS Patient2						
Patient2	PE_Exam_Room	WAIT P5(6.3,25.24) MIN GET Physician_Extender WAIT P6(14.82,4.67,4.18) MIN FREE Physician_Extender						
			1	Patient2	EXIT	0.875600	1	
				Patient2	Exam_Room	0.124400		
Patient2	Exam_Room	RENAME AS Patient3						
Patient3	Exam_Room	GET FP_Physician,1 WAIT P6(14.82,4.67,4.18) FREE FP_Physician						
			1	Patient3	EXIT	FIRST	1	

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* **Arrivals** *

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Entity	Location	Qty each	First Time	Occurrences	Frequency	Logic
Patient	Reception	1		inf	L(3.15,3.6)	

Formatted Listing of Model:
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Model Notes: **TERMINATING SIMULATION**

Combination Medmodel Alternative 2

Reception
First Wait Area
Exam Room
- Screening
- Exam
- Ancillary or Exit

Ancillary (ancillary is not shown\used due to MedModel Constraints)
- Lab
- Rad
- Pharm

5 Physicians and 4 Extenders to Service 10294 enrolled beneficiaries approximately 48355 visits per year. REVISED GOAL FOR THIS MODEL: Since 12% of Physician Extender Patients see FP Physician; new annual patient visit capacity goal=54,177.

Patient 1 sees FP_Physician
Patient 2 sees Physician Extender
Pateint 3 sees Physician Extender then FP_Physician (12.4%)
Time Units: Minutes
Distance Units: Feet

****
* **Locations** *
****

Name	Cap	Units	Stats	Rules
Reception	inf	1	Detailed	Oldest, FIFO,
Waiting_Area	50	1	Detailed	Oldest, FIFO,
Exam_Room	1	10	Detailed	Oldest, , First
Exam_Room.1	1	1	Detailed	Oldest, ,
Exam_Room.2	1	1	Detailed	Oldest, ,
Exam_Room.3	1	1	Detailed	Oldest, ,
Exam_Room.4	1	1	Detailed	Oldest, ,
Exam_Room.5	1	1	Detailed	Oldest, ,

Exam_Room.6	1	1	Detailed	Oldest, ,
Exam_Room.7	1	1	Detailed	Oldest, ,
Exam_Room.8	1	1	Detailed	Oldest, ,
Exam_Room.9	1	1	Detailed	Oldest, ,
Exam_Room.10	1	1	Detailed	Oldest, ,
PE_Exam_Room	1	8	Detailed	Oldest, , First
PE_Exam_Room.1	1	1	Detailed	Oldest, ,
PE_Exam_Room.2	1	1	Detailed	Oldest, ,
PE_Exam_Room.3	1	1	Detailed	Oldest, ,
PE_Exam_Room.4	1	1	Detailed	Oldest, ,
PE_Exam_Room.5	1	1	Detailed	Oldest, ,
PE_Exam_Room.6	1	1	Detailed	Oldest, ,
PE_Exam_Room.7	1	1	Detailed	Oldest, ,
PE_Exam_Room.8	1	1	Detailed	Oldest, ,

****

* **Clock downtimes for Locations** *

****

Loc	Frequency	First Time	Priority	Scheduled	Disable	Logic
Exam_Room	24 hr	4.75 hr	90	Yes	No	Wait 1 hr
Exam_Room.1	24 hr	4.75 hr	90	Yes	No	wait 1 hr
Exam_Room.2	24 hr	4.75 hr	90	Yes	No	wait 1 hr
Exam_Room.3	24 hr	4.75 hr	90	Yes	No	wait 1 hr
Exam_Room.4	24 hr	4.75 hr	90	Yes	No	wait 1 hr
Exam_Room.5	24 hr	4.75 hr	90	Yes	No	Wait 1 hr
Exam_Room.6	24 hr	4.75 hr	90	Yes	No	Wait 1 hr
Exam_Room.7	24 hr	4.75 hr	90	Yes	No	Wait 1 hr
Exam_Room.8	24 hr	4.75 hr	90	Yes	No	Wait 1 hr
Exam_Room.9	24 hr	4.75 hr	90	Yes	No	Wait 1 hr
Exam_Room.10	24 hr	4.75 hr	90	Yes	No	Wait 1 hr
PE_Exam_Room	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.1	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.2	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.3	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.4	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.5	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.6	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.7	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr
PE_Exam_Room.8	24 hr	4.75 hr	90	Yes	No	WAIT 1 hr

Entities

Name	Speed (fpm)	Stats
Patient	114	Detailed
Patient2	114	Detailed
Patient3	114	Detailed

Resources

Name	Units	Resource Stats	Entity Search	Search	Path	Motion
FP_Physician	5	By Unit	Least Used	Oldest		Empty: 114 fpm Full: 114 fpm
Physician_Extender	4	By Unit	Least Used	Oldest		Empty: 114 fpm Full: 114 fpm

Clock downtimes for Resources

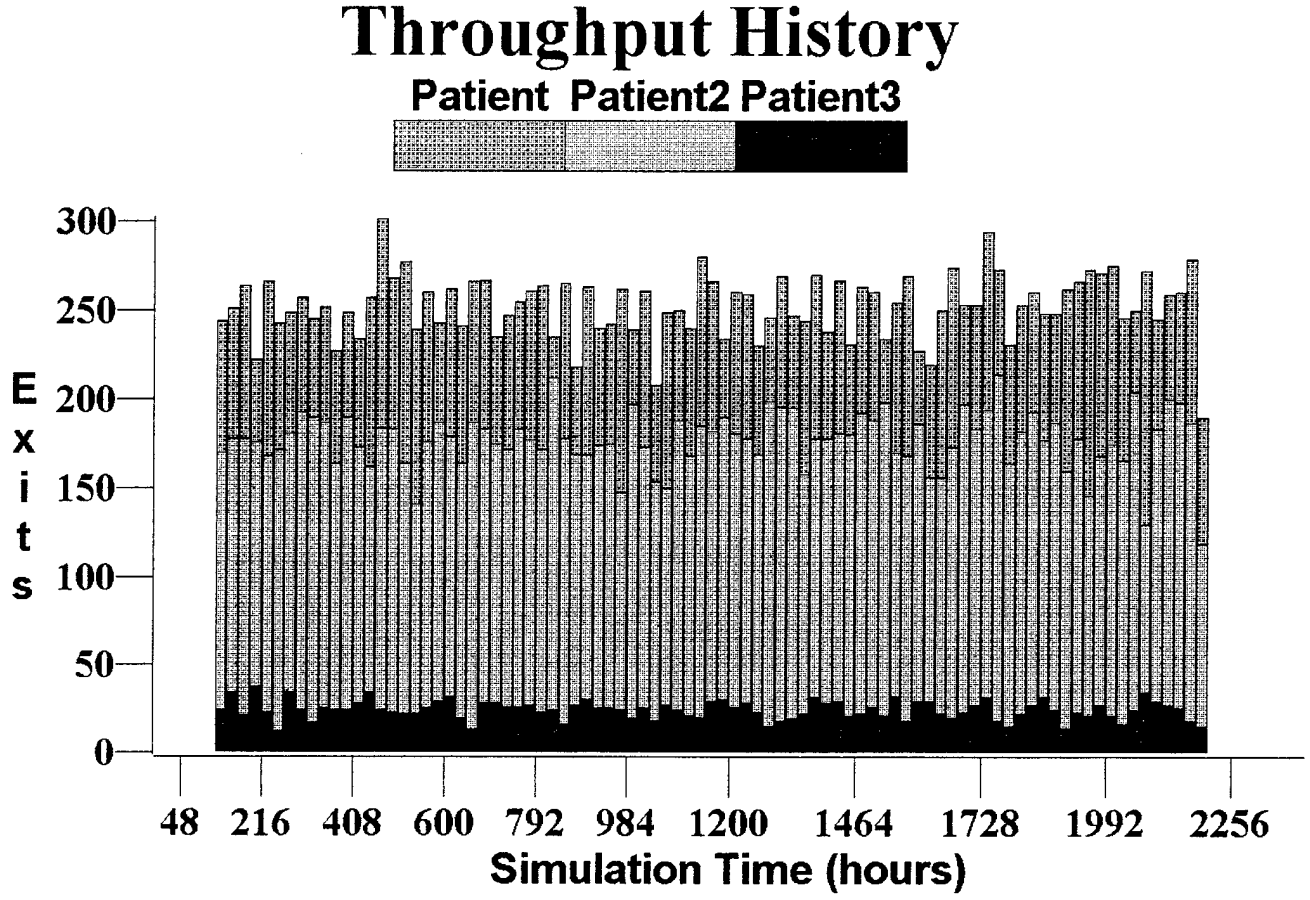
Res	Frequency	First Time	Priority	Scheduled	Node	List	Disable Logic
FP_Physician	24 hr	4.75 hr	90	Yes		No	wait 1 hr
Physician_Extender	24 hr	4.75 hr	90	Yes		No	wait 1 hr

Processing

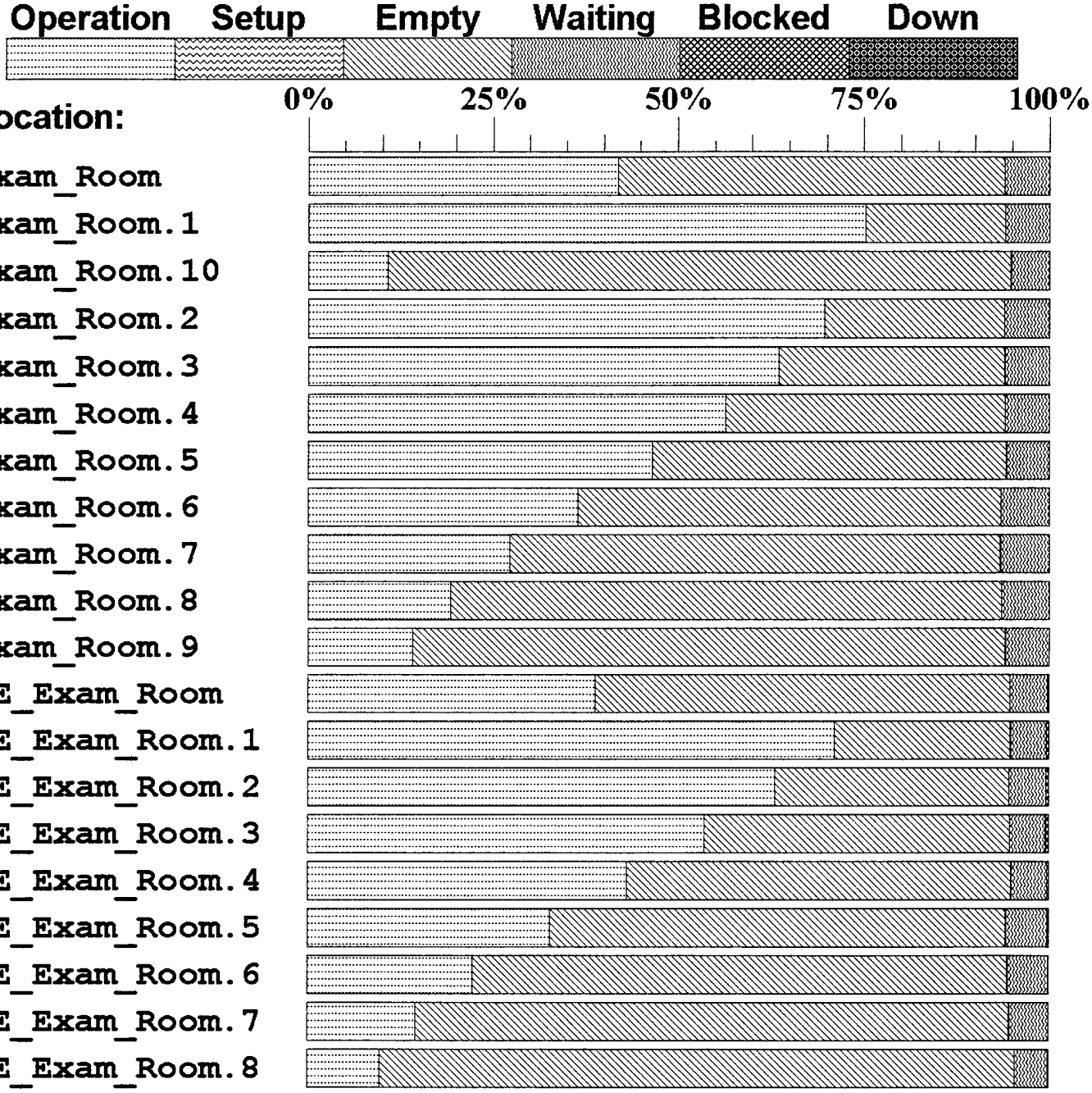
Entity	Location	Process Operation	Blk	Output	Destination	Rule	Move	Exit Logic
Patient	Reception	wait 1 min	1	Patient	Waiting_Area	FIRST	1	
Patient	Waiting_Area		1	Patient	Exam_Room	0.555600	1	
				Patient	PE_Exam_Room	0.444400		
Patient	Exam_Room	PROVIDER=1						
		WAIT P5(6.3,25.24) MIN						
		GET FP_Physician						
		Wait P6(14.82,4.67,4.18)						
		FREE FP_Physician						
			1	Patient	EXIT	MOST	1	
Patient	PE_Exam_Room	Provider=2						
		RENAME AS Patient2						
Patient2	PE_Exam_Room	WAIT P5(6.3,25.24) MIN						
		GET Physician_Extender						
		WAIT P6(14.82,4.67,4.18) MIN						
		FREE Physician_Extender						
			1	Patient2	EXIT	0.875600	1	
				Patient2	Exam_Room	0.124400		
Patient2	Exam_Room	RENAME AS Patient3						
Patient3	Exam_Room	GET FP_Physician,1						
		WAIT P6(14.82,4.67,4.18)						
		FREE FP_Physician						
			1	Patient3	EXIT	FIRST	1	

Arrivals

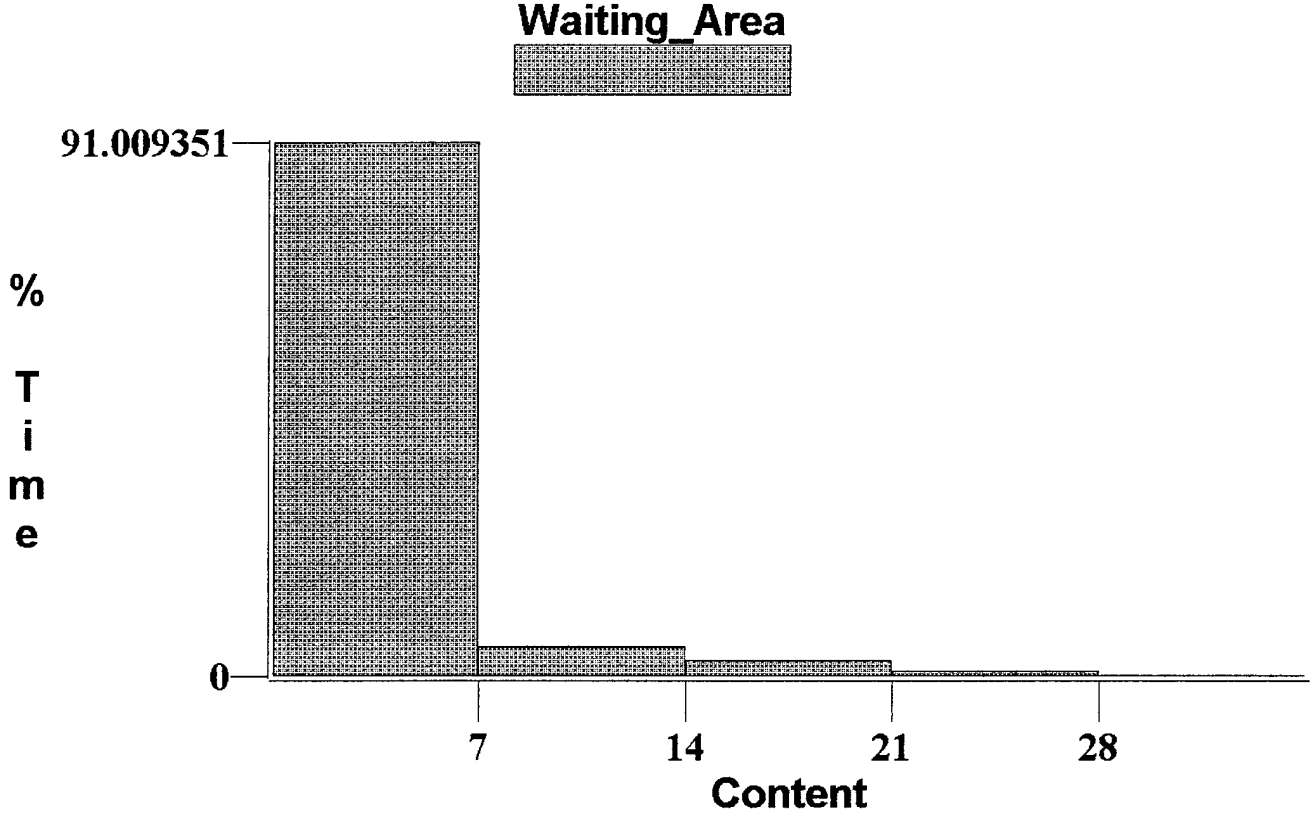
Entity	Location	Qty each	First Time	Occurrences	Frequency	Logic
Patient	Reception	1		inf	L(3.15,3.6)	


Throughput History
Patient Patient2 Patient3
300
250
200
150
100
50
0
Exits
48 216 408 600 792 984 1200 1464 1728 1992 2256
Simulation Time (hours)

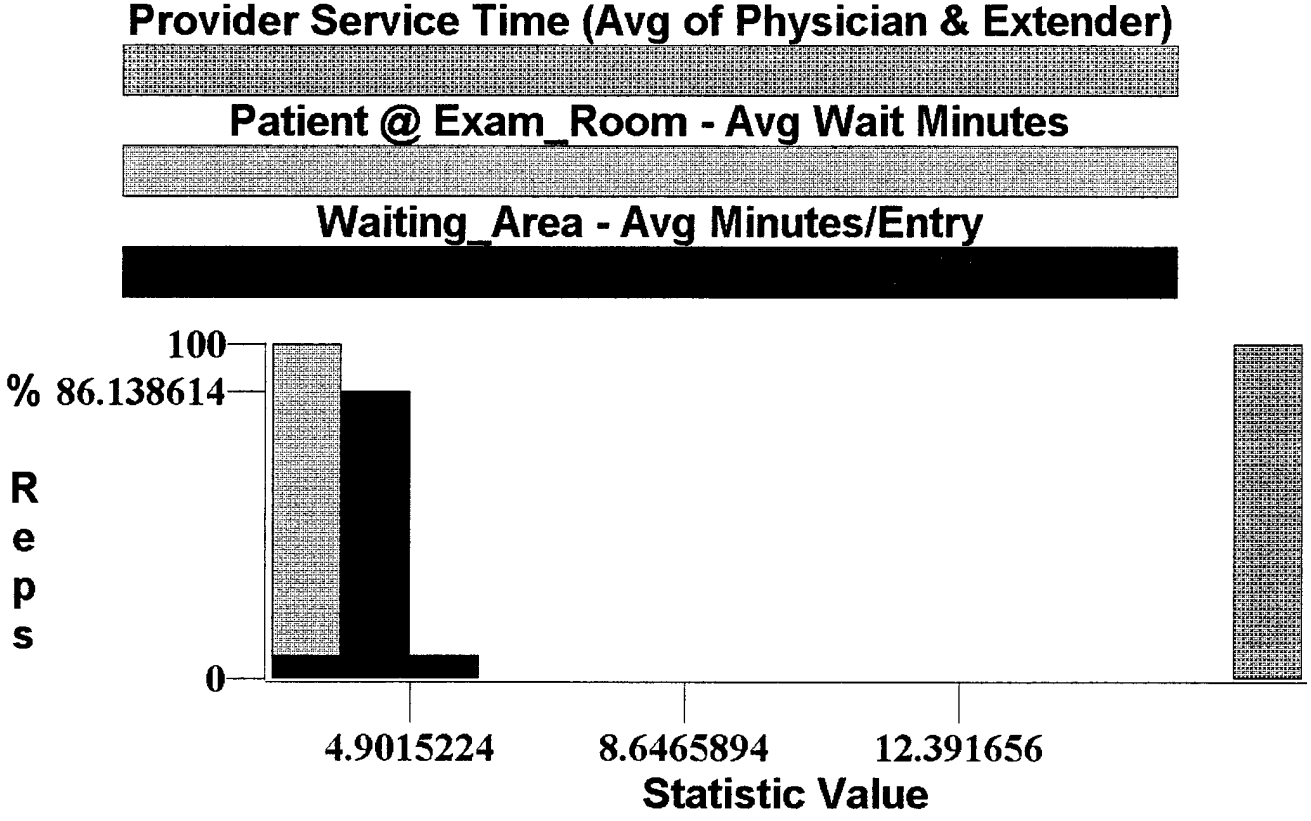
Location State



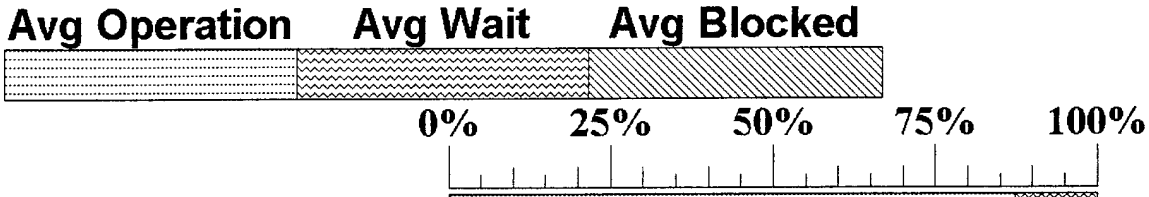
Content Histogram



Multiple Replication Histogram



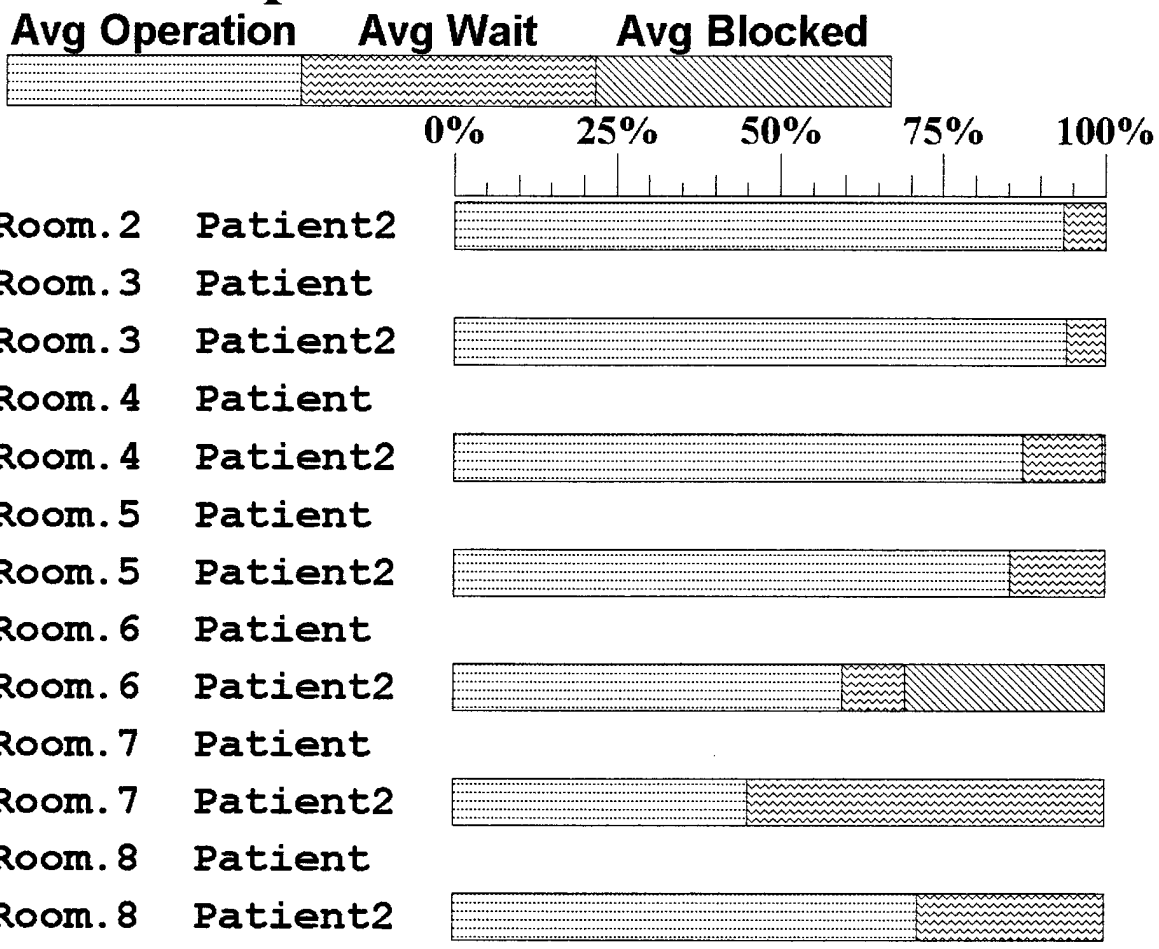
Operation State



Log:

Exam_Room	Patient
Exam_Room	Patient2
Exam_Room	Patient3
Exam_Room.1	Patient
Exam_Room.1	Patient2
Exam_Room.1	Patient3
Exam_Room.10	Patient
Exam_Room.2	Patient
Exam_Room.2	Patient2
Exam_Room.2	Patient3
Exam_Room.3	Patient
Exam_Room.3	Patient2
Exam_Room.3	Patient3
Exam_Room.4	Patient
Exam_Room.4	Patient2
Exam_Room.4	Patient3
Exam_Room.5	Patient
Exam_Room.6	Patient
Exam_Room.7	Patient
Exam_Room.8	Patient
Exam_Room.9	Patient
PE_Exam_Room	Patient
PE_Exam_Room	Patient2
PE_Exam_Room.1	Patient
PE_Exam_Room.1	Patient2
PE_Exam_Room.2	Patient

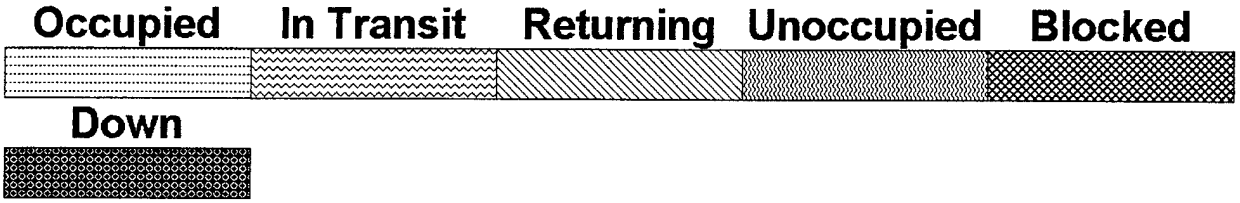
Operation State

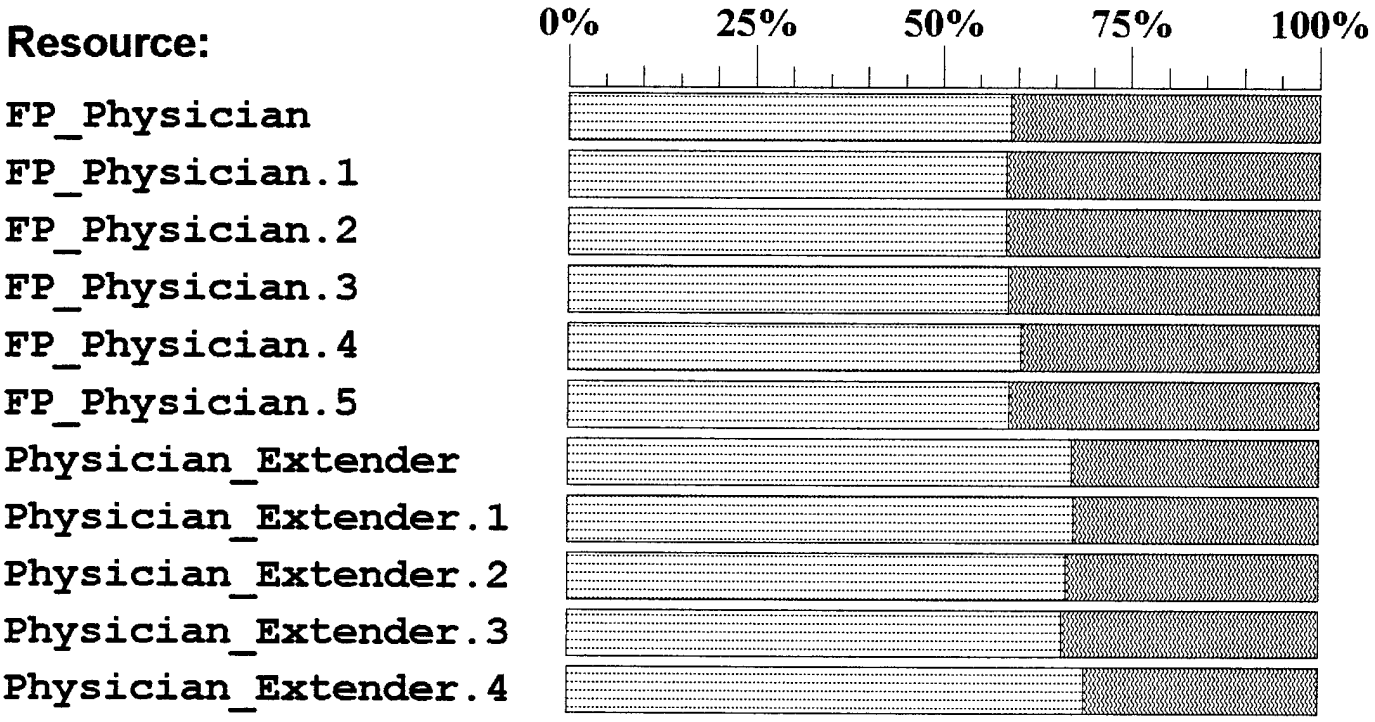


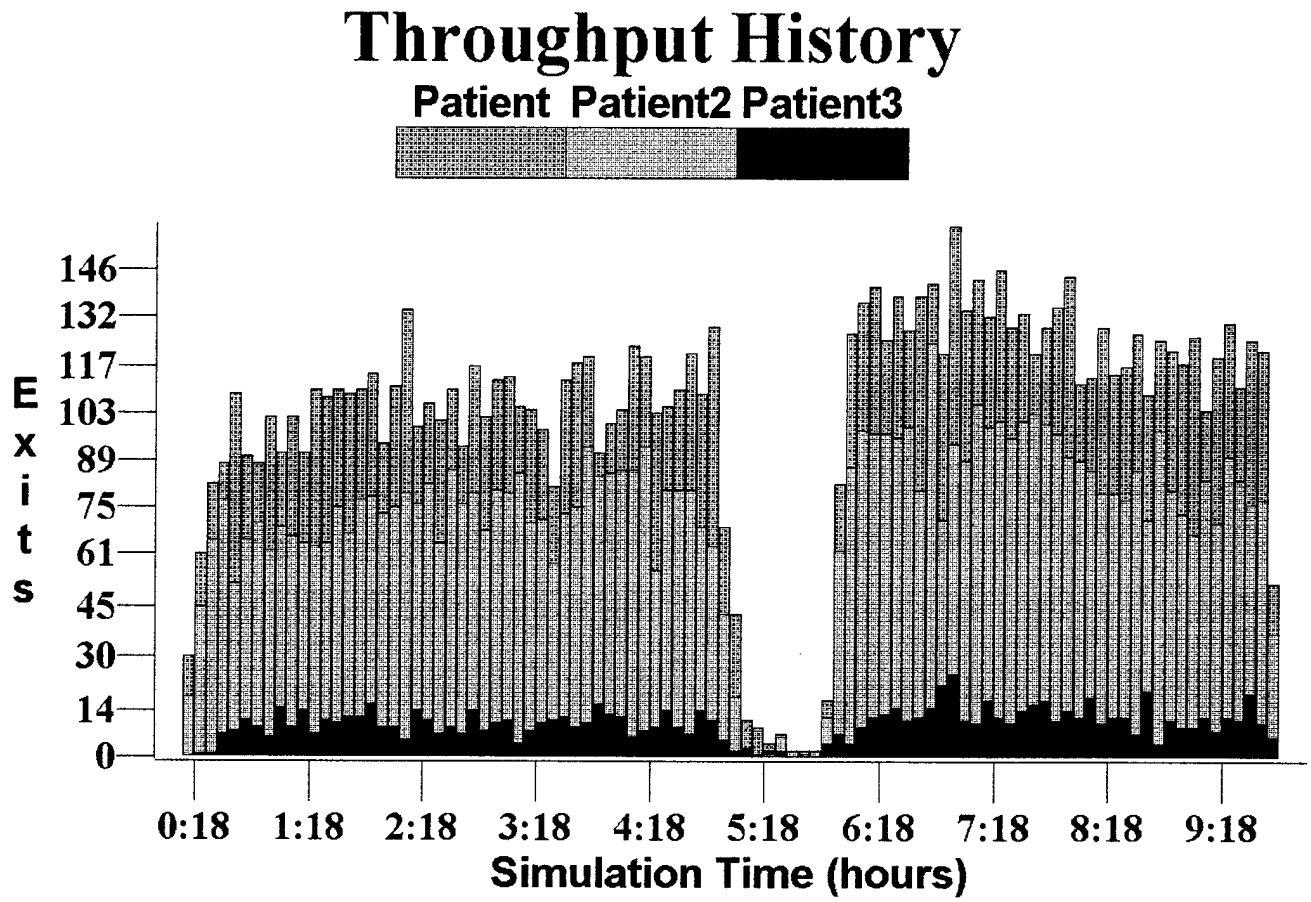
Log:

PE_Exam_Room.2	Patient2
PE_Exam_Room.3	Patient
PE_Exam_Room.3	Patient2
PE_Exam_Room.4	Patient
PE_Exam_Room.4	Patient2
PE_Exam_Room.5	Patient
PE_Exam_Room.5	Patient2
PE_Exam_Room.6	Patient
PE_Exam_Room.6	Patient2
PE_Exam_Room.7	Patient
PE_Exam_Room.7	Patient2
PE_Exam_Room.8	Patient
PE_Exam_Room.8	Patient2

Resource State






Throughput History
Patient Patient2 Patient3
Exits
146
132
117
103
89
75
61
45
30
14
0
0:18
1:18
2:18
3:18
4:18
5:18
6:18
7:18
8:18
9:18
Simulation Time (hours)

Multiple Replication Histogram

Exam_Room - Total Entries

○

FP_Physician - % Occupied

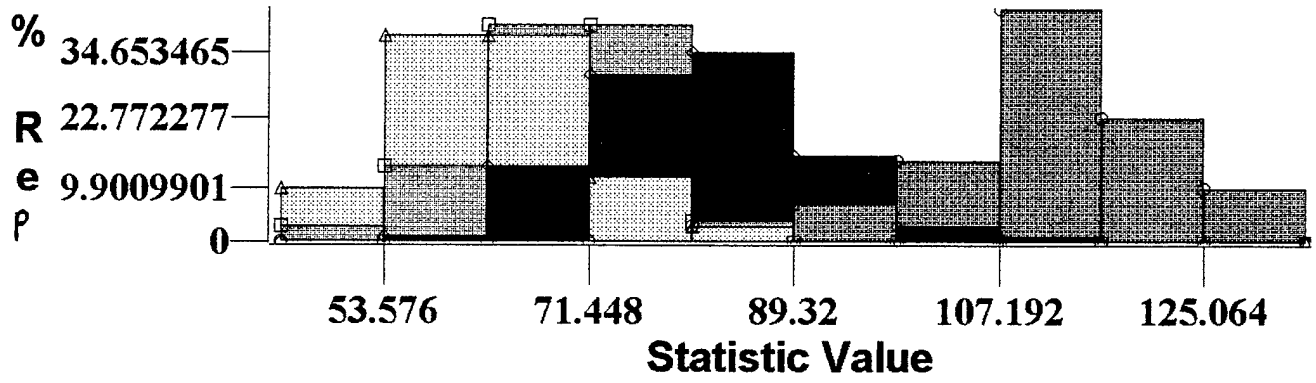
□

PE_Exam_Room - Total Entries

◇

Physician_Extender - % Occupied

△



INPUT VARIABLES

	PHYSICIAN	PHYSICIAN EXTENDER
% Pts Able to Service	100.00%	72.00%
PANEL SIZE	1300	1300
ANNUAL SALARY*	$97,211.00	$64,001.00

* MEPRs Replacement Cost

ENROLLED BENEFICIARIES (or Projected)

	AD	ADFM	Ret/FM	DAC/FM	Current Residual
	3777	6222	1136	5005	295
Include =1 do not = 0	1	1	0	0	1

Residual = 293 Retirees and 2 DACs.

REQUIREMENTS	PHYSICIANs	PHYSICIAN EXTENDERs
	5	4

TOTAL ENROLLED: 10294

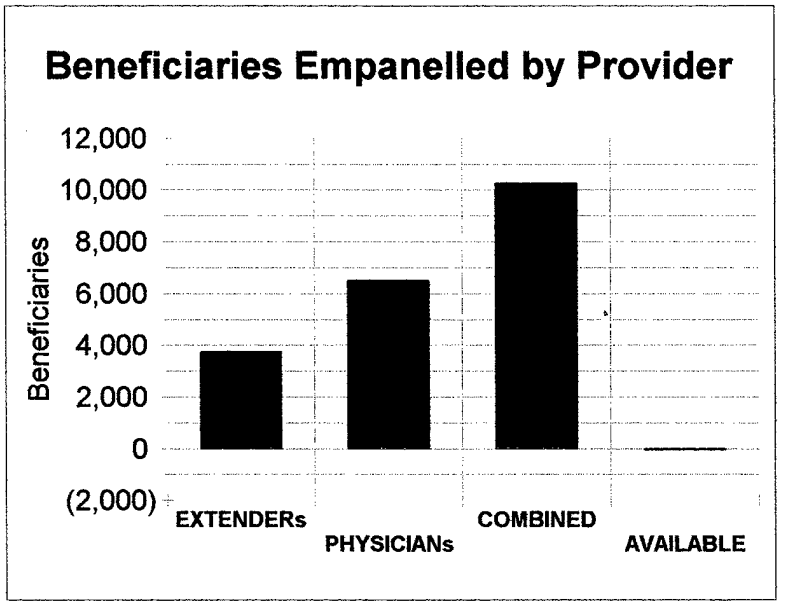
TOTAL ANNUAL COST: $742,059.00

PER BENEFICIARY COST: $72.09

PHYSICIAN EXTENDERs	PHYSICIANs	COST
0	7.92	$769,761.56
1	7.20	$763,770.64
2	6.48	$757,779.72
3	5.76	$751,788.80
4	5.04	$745,797.88
5	4.32	$739,806.96
6	3.60	$733,816.04
7	2.88	$727,825.12
8	2.16	$721,834.20
9	1.44	$715,843.28
10	0.72	$709,852.36

ATTRIBUTED TO PROVIDER COST

* Includes Part-Time



PHYSICIAN EXTENDERs Beneficiaries in Panel	PHYSICIANs Beneficiaries in Panel	COMBINED TOTAL COVERAGE	AVAILABLE POTENTIAL SLACK
3744	6500	10244	-50

***NOTE: Constraint: Physician Extenders cannot outnumber Physicians.**

COST FIGURES: Physicians are considered GS-13 Step 5, Physician Extenders are considered GS-11 Step 5.
COST SOURCE: USAREUR Cir 37-11, Change 1 and Supplement, Grades are IAW USAREUR CPO Guidelines.

CONSTRAINT REMOVED

INPUT VARIABLES

	PHYSICIAN	PHYSICIAN EXTENDER
% Pts Able to Service	100.00%	72.00%
PANEL SIZE	1300	1300
ANNUAL SALARY*	$97,211.00	$64,001.00

* MEPRs Replacement Cost

ENROLLED BENEFICIARIES (or Projected)

	AD	ADFM	Ret/FM	DAC/FM	Current Residual
	3777	6222	1136	5005	295
Include =1 do not = 0	1	1	0	0	1

Residual = 293 Retirees and 2 DACs.

REQUIREMENTS	PHYSICIANs	PHYSICIAN EXTENDERs
	3	7

TOTAL ENROLLED: 10294

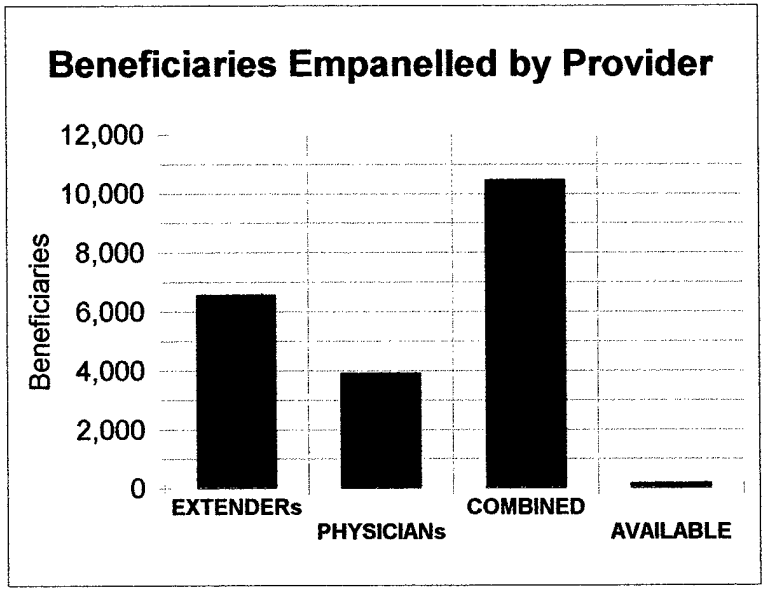
TOTAL ANNUAL COST: $739,640.00

PER BENEFICIARY COST: $71.85

ATTRIBUTED TO PROVIDER COST

PHYSICIAN EXTENDERs	PHYSICIANs	COST
0	7.92	$769,761.56
1	7.20	$763,770.64
2	6.48	$757,779.72
3	5.76	$751,788.80
4	5.04	$745,797.88
5	4.32	$739,806.96
6	3.60	$733,816.04
7	2.88	$727,825.12
8	2.16	$721,834.20
9	1.44	$715,843.28
10	0.72	$709,852.36

* Includes Part-Time



PHYSICIAN EXTENDERs Beneficiaries in Panel	PHYSICIANs Beneficiaries in Panel	COMBINED TOTAL COVERAGE	AVAILABLE POTENTIAL SLACK
6552	3900	10452	158

***NOTE: Constraint Removed: Physician Extenders can outnumber Physicians.**

COST FIGURES: Physicians are considered GS-13 Step 5, Physician Extenders are considered GS-11 Step 5.
COST SOURCE: USAREUR Cir 37-11, Change 1 and Supplement, Grades are IAW USAREUR CPO Guidelines.

APPENDIX 11

The comparison of the two alternative models are illustrated. The descriptive statistics and Pair-Wise t Test of Means are enclosed.

FIRST WAIT TIME

t-Test: Paired Two-Sample for Means	First Wait Time Physician MedModel	First Wait Time Combination MedModel
Mean	**11.71**	**4.49**
Variance	2.51	0.10
Observations	101.00	101.00
Pearson Correlation	0.98	
Pooled Variance	1.30	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**56.75**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha Level = .05	**Significant Difference**	

Descriptive Statistics	First Wait Time Physician MedModel	First Wait Time Combination MedModel
Mean	**11.71**	**4.49**
Standard Error	0.16	0.03
Median	11.40	4.51
Mode	10.16	4.12
Standard Deviation	**1.58**	**0.31**
Variance	2.51	0.10
Kurtosis	0.02	-0.31
Skewness	0.65	0.02
Range	7.49	1.52
Minimum	8.89	3.83
Maximum	16.38	5.35
Sum	1182.56	453.16
Count	101.00	101.00
Confidence Level (0.950000)	0.31	0.06

Confidence Intervals:		
90.00%	**11.44 to 11.98 minutes**	**4.43 to 4.54 minutes**
95.00%	**11.38 to 12.03 minutes**	**4.42 to 4.55 minutes**
99.00%	**11.27 to 12.15 minutes**	**4.40 to 4.57 minutes**

Screening Service Time

t-Test: Paired Two-Sample for Means	Screening Service Time Physician MedModel	Screening Service Time Combination MedModel
Mean	**4.66**	**4.66**
Variance	0.00	0.00
Observations	101.00	101.00
Pearson Correlation	0.97	
Pooled Variance	0.00	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**-1.19**	
P(T<=t) one-tail	0.12	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.24**	
t Critical two-tail	**1.98**	
alpha level = .05	**No Significant Difference**	

Descriptive Statistics	Screening Service Time Physician MedModel	Screening Service Time Combination MedModel
Mean	**4.66**	**4.66**
Standard Error	0.00	0.00
Median	4.66	4.66
Mode	4.66	4.66
Standard Deviation	**0.01**	**0.01**
Variance	0.00	0.00
Kurtosis	0.02	0.93
Skewness	-0.37	-0.33
Range	0.05	0.06
Minimum	4.63	4.63
Maximum	4.68	4.69
Sum	470.84	470.88
Count	101.00	101.00
Confidence Level (0.950000)	0.00	0.00

Confidence Intervals:		
90.00%	**4.66 to 4.6635 minutes**	**4.661 to 4.6635 minutes**
95.00%	**4.659 to 4.6638 minutes**	**4.6589 to 4.6638 minutes**
99.00%	**4.65895 to 4.66456 minutes**	**4.65893 to 4.665 minutes**

Second Wait Time

t-Test: Paired Two-Sample for Means	Second Wait Time Physician MedModel	Second Wait Time Combination MedModel
Mean	**7.57**	**3.39**
Variance	0.05	0.02
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	0.03	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**418.68**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha Level = .05	**Significant Difference**	

Descriptive Statistics	Second Wait Time Physician MedModel	Second Wait Time Combination MedModel
Mean	7.57	**3.39**
Standard Error	0.02	0.01
Median	7.58	3.39
Mode	7.42	3.39
Standard Deviation	0.23	**0.13**
Variance	0.05	0.02
Kurtosis	-0.23	-0.25
Skewness	-0.03	0.12
Range	1.18	0.67
Minimum	6.99	3.03
Maximum	8.17	3.70
Sum	764.84	342.20
Count	101.00	101.00
Confidence Level (0.950000)	0.04	0.03

Confidence Intervals:		
90.00%	**7.53 to 7.61 minutes**	**3.37 to 3.41 minutes**
95.00%	**7.526 to 7.62 minutes**	**3.36 to 3.414 minutes**
99.00%	**7.51 to 7.64 minutes**	**3.35 to 3.42 minutes**

Provider Service Time

t-Test: Paired Two-Sample for Means	Provider Service Time Physician MedModel	Provider Service Time Combination MedModel
Mean	**16.88**	**16.89**
Variance	0.00	0.01
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	0.00	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**-7.33**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha= .05	**Significant Difference**	

Descriptive Statistics	Provider Service Time Physician MedModel	Provider Service Time Combination MedModel
Mean	**16.88**	**16.89**
Standard Error	0.01	0.01
Median	16.87	16.89
Mode	16.85	16.85
Standard Deviation	**0.05**	**0.07**
Variance	0.00	0.01
Kurtosis	0.35	0.04
Skewness	0.44	0.11
Range	0.29	0.35
Minimum	16.74	16.72
Maximum	17.03	17.07
Sum	1704.44	1705.99
Count	101.00	101.00
Confidence Level (0.950000)	0.01	0.01

Confidence Intervals:		
90.00%	**16.867 to 16.885 minutes**	**16.887 to 16.9 minutes**
95.00%	**16.866 to 16.887 minutes**	**16.871 to 16.912 minutes**
99.00%	**16.862 to 16.891 minutes**	**16.865 to 16.908 minutes**

Total Time in FPC

t-Test: Paired Two-Sample for Means	Total Time in FPC Physician MedModel	Total Time in FPC Combination MedModel
Mean	**40.82**	**29.66**
Variance	3.50	1.46
Observations	101.00	101.00
Pearson Correlation	0.52	
Pooled Variance	4.56	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**61.60**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha= .05	**Significant Difference**	

Descriptive Statistics	Total Time in FPC Physician MedModel	Total Time in FPC Combination MedModel
Mean	**40.82**	**29.66**
Standard Error	0.19	0.12
Median	40.51	29.47
Mode	40.40	29.67
Standard Deviation	**1.87**	**1.21**
Variance	3.50	1.46
Kurtosis	-0.05	10.86
Skewness	0.56	3.12
Range	9.01	7.15
Minimum	37.25	28.21
Maximum	46.26	35.36
Sum	4122.68	2996.03
Count	101.00	101.00
Confidence Level (0.950000)	0.36	0.24

Terminating Simulation

Provider Utilization Rate (% Occupied in Patient Exam)

t-Test: Paired Two-Sample for Means	Provider Utilization Rate Physician MedModel	Provider Utilization Rate Combination MedModel
Mean	**72.01**	**66.41**
Variance	47.01	60.27
Observations	101.00	101.00
Pearson Correlation	0.99	
Pooled Variance	53.74	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**47.52**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Provider Utilization Rate Physician MedModel	Provider Utilization Rate Combination MedModel
Mean	**72.01**	**66.41**
Standard Error	0.68	0.77
Median	72.11	66.70
Mode	69.95	NA
Standard Deviation	**6.86**	**7.76**
Variance	47.01	60.27
Kurtosis	0.60	0.08
Skewness	-0.56	-0.05
Range	34.78	40.56
Minimum	51.32	46.75
Maximum	86.10	87.31
Sum	7273.02	6707.79
Count	101.00	101.00
Confidence Level (0.950000)	1.34	1.51

Confidence Intervals:		
90.00%	**70.85% to 73.17%**	**65.09% to 67.74%**
95.00%	**70.61% to 73.41%**	**64.821% to 68.01%**
99.00%	**70.12% to 73.89%**	**64.27% to 68.562%**

Terminating Simulation

Patient Visit Capacity

t-Test: Paired Two-Sample for Means	Total Patient Visits per Day Physician MedModel	Total Patient Visits per Day Combination MedModel
Mean	**186.09**	**193.64**
Variance	208.45	359.67
Observations	100.00	101.00
Pearson Correlation	NA	
Pooled Variance	303.44	
Hypothesized Mean Difference	0.00	
df	**100.00**	
t	**-17.43**	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.66	
P(T<=t) two-tail	**0.00**	
t Critical two-tail	**1.98**	
alpha level = .05	**Significant Difference**	

Descriptive Statistics	Total Patient Visits per Day Physician MedModel	Total Patient Visits per Day Combination MedModel
Mean	**186.09**	**193.64**
Standard Error	1.44	1.89
Median	185.00	193.00
Mode	185.00	184.00
Standard Deviation	**14.44**	**18.97**
Variance	208.45	359.67
Kurtosis	0.03	0.29
Skewness	0.41	-0.10
Range	70.00	103.00
Minimum	156.00	139.00
Maximum	226.00	242.00
Sum	18609.00	19558.00
Count	100.00	101.00
Confidence Level (0.950000)	2.83	3.70

Confidence Intervals:		
90.00%	**184.3 to 189.84**	**190.42 to 196.87**
95.00%	**183.73 to 190.41**	**189.76 to 197.53**
99.00%	**182.57 to 191.57**	**188.4 to 198.89**

PATIENT VISIT GOAL: Visit Capacity/Year **Total Military and Family Member Beneficiary Enrollment =**	**Mean X 260 Clinic Days per Year**	**Mean X 260 Clinic Days per Year**
48372	**48383.40**	**50347.33**
	Meets Goal	**MEETS GOAL (not Revised)**

REVISED ANNUAL VISIT GOAL for Combination MedModel **Patient Visit Goal X 1.12 (12% of PE Patients see Physician)**	**DOES NOT MEET REVISED GOAL**
51032.46	**Shortage of: 685.13**

APPENDIX 12

PERIPHERAL OBSERVATIONS & FOLLOW-ON STUDY OPPORTUNITIES

These peripheral observations are mentioned to improve efficiencies in the FPC. Analysis of other primary care activities may enlighten the HMEDDAC to changes that improve opportunities of gaining greater economies of scope and scale.

Draw laboratory specimens at the FPC. This is a patient-focused change. Laboratory specimens drawn in the exam room will increase patient satisfaction because patients will not have to go to the lab, wait, and have specimens drawn. This change works well with employment of the CHCS system in the 2d/3d Quarter of FY1996.

Outpatient records should be moved to the FPC area. This change is patient-focused and may increase efficiency in the FPC. If the records are in close proximity of the FPC providers and staff, information is readily accessible. Also, patients do not have to go to two buildings to visit the FPC.

The Outpatient Clinic should be closed. When all military personnel and their families are enrolled in the Family Practice Program, a small portion of the beneficiary population remains. Creative scheduling in the FPC can allow Outpatient Clinic closure.

A dictation system for the FPC Providers will increase efficiency. The current hand written patient visit notes (on the SF 600) takes too much time and creates readability problems. A test and analysis of this change may prove beneficial.

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